## Document Revisions

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</tr>
</tbody>
</table>
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# Table of Contents

1.0  INTRODUCTION  ......................................................................................................................... 1  
1.1  Scope  ......................................................................................................................................... 1  
1.2  Background  ................................................................................................................................. 1  
   1.2.1  Next Generation Radar  ......................................................................................................... 1  
   1.2.2  Radar Operations Center  ....................................................................................................... 1  
   1.2.3  Software Engineering  ............................................................................................................. 1  
1.3  Document Organization  ................................................................................................................ 2  
2.0  SOFTWARE DEVELOPMENT/MAINTENANCE  ........................................................................... 3  
   2.1  Project Initiation  ........................................................................................................................ 3  
      2.1.1  Notification  .......................................................................................................................... 3  
      2.1.2  Software Configuration Change Requests  ............................................................................ 3  
      2.1.3  Software Change Categories  ............................................................................................... 3  
   2.2  Analysis  .................................................................................................................................... 4  
      2.2.1  Investigation  ....................................................................................................................... 4  
      2.2.2  Proposed Initial Design  ....................................................................................................... 4  
      2.2.3  Cost Estimates  ..................................................................................................................... 4  
      2.2.4  Resource Metrics  ................................................................................................................ 4  
   2.3  Design  ..................................................................................................................................... 5  
      2.3.1  Detailed Design  ................................................................................................................... 5  
      2.3.2  Design Approach Review  .................................................................................................... 5  
   2.4  Development  ............................................................................................................................ 5  
      2.4.1  Development Systems - Hardware  ....................................................................................... 5  
      2.4.2  Development Systems - Software  ...................................................................................... 5  
      2.4.3  Coding Standards  .............................................................................................................. 5  
      2.4.4  Meteorological Algorithm Development  ............................................................................. 6  
   2.5  Testing  .................................................................................................................................... 6  
      2.5.1  Test Procedures  .................................................................................................................. 6  
      2.5.2  Testing Phases  ..................................................................................................................... 6  
      2.5.3  Test Reports  ....................................................................................................................... 7  
   2.6  Documentation  .......................................................................................................................... 7  
      2.6.1  Source Code  ....................................................................................................................... 7  
      2.6.2  Technical Data  ................................................................................................................... 7  
   2.7  Release  .................................................................................................................................... 9  
      2.7.1  Introducing Source Code To Razor  .................................................................................... 9  
      2.7.2  Update Status  ..................................................................................................................... 9  
      2.7.3  Software Released For Formal Test  ................................................................................... 9  
3.0  SYSTEM LIFECYCLE  ................................................................................................................ 11  
   3.1  Project Documentation  ............................................................................................................... 11  
      3.1.1  Work Practice Instructions  ................................................................................................. 11  
      3.1.2  Requests For Change  ......................................................................................................... 11  
      3.1.3  Engineering Change Proposals  ......................................................................................... 11  
      3.1.4  Configuration Change Requests  ....................................................................................... 11  
      3.1.5  Issues  .................................................................................................................................. 12  
   3.2  Committees & Review Boards  .................................................................................................. 12
1.0 INTRODUCTION
This section provides a brief introduction to the systems being maintained by the Radar Operations Center (ROC).

1.1 Scope
This document provides a detailed description of the processes in place for software (SW) development and maintenance in the ROC Software Engineering (ROC/SWE) section.

1.2 Background

1.2.1 Next Generation Radar
The Next Generation Radar (NEXRAD) Weather Surveillance Doppler Radar of 1988 (WSR-88D) is a stand-alone software-driven system that collects, processes, and distributes meteorological radar data to external users. The SW controls radar operating characteristics, processes data via various meteorological algorithms, and controls product creation and distribution to external users. The WSR-88D supports the needs of user agencies within the Departments of Commerce (DOC), Defense (DOD), and the Transportation (DOT). The WSR-88D is comprised of two main components: the Radar Data Acquisition (RDA) subsystem and the Radar Products Generator (RPG). The Principle User Processor (PUP) is not part of the WSR-88D system, but is maintained by the ROC and follows similar development and maintenance processes as the WSR-88D subsystems.

1.2.2 Radar Operations Center
In 1988, WSR-88D ROC was established in Norman, Oklahoma to support the mission of NEXRAD. The ROC is a “tri-agency” organization comprised of government employees (from the DOC, DOD, and DOT) and support contractors. The ROC provides centralized meteorological, SW, maintenance, technical, and engineering support for all WSR-88D systems.

1.2.3 Software Engineering
ROC/SWE is responsible for the development and maintenance of the SW used by the WSR-88D and the PUP. ROC/SWE works closely with other sections at the ROC and external weather data display systems to ensure interoperability as hardware and SW capability is upgraded and replaced.

1.2.3.1 Radar Data Acquisition Sub-system
The RDA is the sub-system that collects and transmits digital base weather data to the RPG subsystem. The RDA controls the radar antenna and implements selected scan patterns. The RDA SW also provides alarms, performance and maintenance data, and status information to the RPG. The radar equipment is contained in an equipment shelter which is referred to as the RDA shelter and is located near the radar tower.

1.2.3.2 Radar Products Generator Sub-system
The RPG produces a variety of meteorological products by processing RDA base weather data through meteorological algorithms. The products are distributed to external users through various communications connections. The RPG also provides remote control of the RDA and provides radar system status and alerting of weather phenomenon to external users. The RPG is typically located in a Weather Forecast Office, but for some configurations is placed in the RDA shelter.
1.2.3.3 **Principle User Processor Sub-system**

The PUP is the primary weather display system of the DOD and located on military installations around the world. The PUP displays weather data products received from the RPG and provides operator notification of weather alerts, and displays overall system status.

1.2.3.4 **External User Support**

Weather data products are distributed to external users, including the National Weather Service (NWS) Advanced Weather Interactive Processor System (AWIPS), the Federal Aviation Administration (FAA) Weather And Radar Processor, Integrated Terminal Weather System, and the DOD’s PUP. ROC/SWE works closely with these groups through Memoranda of Agreement and Interface Control Documents (ICDs) to ensure interoperability.

1.3 **Document Organization**

The SW development and maintenance process will be described first. Details on supporting processes, information, descriptions, and definitions will be presented and discussed afterwards.
2.0 SOFTWARE DEVELOPMENT/MAINTENANCE

This section describes the process to be followed by ROC/SWE in performing SW development and maintenance for the WSR-88D.

2.1 Project Initiation

2.1.1 Notification

The ROC/SWE maintenance process can be initiated in numerous ways, including user requests via various boards and committees associated with the WSR-88D, Hotline support calls, Requests for Technical Information (RTIs), and test reports.

2.1.2 Software Configuration Change Requests

Any change to NEXRAD SW baselines maintained by the ROC must be preceded by an approved SW Configuration Change Request (CCR). CCRs are used to track requested changes through the software maintenance process.

2.1.2.1 Internal Configuration Change Requests

Most SW CCRs are created by ROC personnel. These CCRs are the result of problems discovered during testing, newly identified requirements, and the result of RTIs. Internal CCRs will be created in accordance with the SW CCR process defined in a Work Practice Instruction (WPI), WPI0045, Agile Software CCR Instructions.

2.1.2.2 External Configuration Change Requests

SW CCRs can also be created by WSR-88D external users submitting an FAA Casefile, NWS Request for Change (RC), or a DOD Agile SW CCR. NWS RCs are normally submitted by the NWS Point Of Contact, however ROC engineers may submit (or be asked to submit) an NWS RC due to their familiarity with the problems involved. RCs generated by ROC personnel for the NWS are covered by WPI0012, Agile – (ENG) ROC (NWS) RC Originator Instructions. The CCR may be created by the NWS Headquarters (or the ROC) once the RC is approved.

2.1.2.3 Multi Software Configuration Change Requests

If a SW change necessitates a change to a NEXRAD system database (such are SiteID or Comms), an associated System CCR will be required to make the database change. A “Multi” SW CCR will be created for the SW portion.

2.1.3 Software Change Categories

Software modifications have been divided into four types of changes: Enhancements, Bug Fixes, Maintenance, and Obsolescence.

2.1.3.1 Enhancement

An enhancement is the result of a new requirement, a modification to an existing requirement, a new product or message, a change to an operational tool, a change that impacts the operator, or the activation of non-operational code.

2.1.3.1.1 Minor Enhancement

Minor enhancements have no impact to external users, require no additional funding, and require no hardware modifications. These changes are adjudicated by the Technical Review Committee (TRC). For more information, refer to WPI0045, Agile Software CCR Instructions.
2.1.3.1.2 Major Enhancement
Major enhancements include new algorithms and products, changes requiring additional funding or hardware modification, and changes that impact external users. Major enhancements must be approved by the NEXRAD Software Recommendation and Evaluation Committee (SREC) and could also be required to go through the NWS Operations and Services Improvement Process (OSIP), particularly if the change affects external NWS systems not maintained by the ROC. Major enhancements to algorithms require the approval of the TAC in addition to that of the SREC. For more information, refer to WPI0045, Agile Software CCR Instructions.

2.1.3.2 Bug Fix
A bug fix corrects errors or omissions introduced in previous software versions.

2.1.3.3 Maintenance
Maintenance changes are those that occur in every build. These include updating software version numbers, virus data file updates, security patches, compiler updates, and changes to non-operational tools.

2.1.3.4 Obsolescence
Obsolescence changes result from the removal of a requirement, functionality, or product. Obsolescence CCRs must be approved by the SREC prior to implementation.

2.2 Analysis

2.2.1 Investigation
The Software Developer (SWD) will attempt to recreate any problem reported and analyze the results until a cause is determined. The SWD may be required to perform some problem analysis prior to creating the SW CCR in order to accurately describe the problem and propose possible solutions. In general, the Problem and Solution sections of the CCR form should be as descriptive as possible in order for external reviewers to fully understand the problem and how the problem will be addressed by the software solution.

2.2.2 Proposed Initial Design
Once the investigation is complete, the SWD shall propose an initial design for a software change. The proposed initial design will include a high-level design solution, an impact statement, a list of impacted shared code, a list of impacted Computer Program Configuration Items (CPCIs), a list of impacted documentation, and any security impacts. The proposed initial design shall be documented in a CCR in accordance with WPI00045, Agile Software CCR Instructions.

2.2.3 Cost Estimates
Once the SWD has proposed an initial design, the SWD will estimate the level of effort required to implement the proposed design. This estimate will include software lines of code and man-hours required to implement and test changes. The cost information will be used to assign a level of risk associated with implementation of the CCR.

2.2.4 Resource Metrics
The SWD will decide what resources will be required to implement the design. This will include manpower, hardware or software requirements, and test bed assets required.
2.3 Design

2.3.1 Detailed Design
The SWD will design a detailed solution based on the proposed initial design documented in the CCR.

2.3.2 Design Approach Review
The Design Approach Review (DAR) is a joint review with interested stakeholders to reach an agreement on the detailed design. The DAR is to be held as early as possible in the design phase and is required for changes that affect the external user of the system or the system operator. *WPI0037, Transfer Of RPG Science To The ROC* contains guidance on DAR requirements and content.

2.4 Development
The SWD will implement the software changes according to the approved design.

2.4.1 Development Systems - Hardware

2.4.1.1 Development Workstations
RDA, RPG, and PUP software is developed on a Personal Computer compatible computer system under RedHat Enterprise Linux.

2.4.1.2 Software Test Bed
ROC/SWE operates and maintains a Software Test Bed (SWTB). The SWTB contains fully functional and reconfigurable representations of fielded systems. The SWTB is used to investigate reported problems from the field and test software under development.

2.4.2 Development Systems - Software

2.4.2.1 Razor
Razor is a third party commercial software package used as a repository for all source code developed by ROC/SWE. Razor has the capability to maintain several baselines concurrently and is administered by ROC Configuration Management (ROC/CM). Razor Versions is a software version control tool used to manage software changes. The Razor Issues database tracks possible defects identified during testing and changes to the WSR-88D software baseline. See 3.1.5 for more information.

2.4.3 Coding Standards
Coding standards define a set of rules and common practices related to developing software. The SWD is expected to follow any coding standards defined for their subsystem. In the absence of defined coding standards, the SWD should follow the same style and convention used by the original developer.

2.4.3.1 RDA
RDA Software Coding Standards for the Java and C programming languages are contained in the *RDA Software Development Plan (SDP), OSTPLN-ORDA-002*.

2.4.3.2 RPG
RPG C Coding Standards for the C programming language are contained in *WPI0051, RPG C Coding Standard*.
2.4.3.3 PUP
The PUP does not currently have an established software coding standard.

2.4.4 Meteorological Algorithm Development
Meteorological algorithms are included as part of the RPG baseline, however most algorithms are developed by WSR-88D Implementing Organizations (IOs). All algorithms are initially submitted to the Technical Advisory Committee (TAC) for consideration and review. If approved by the TAC, the SREC will recommend a specific build for release.

2.4.4.1 Implementing Organizations
New algorithms may be submitted to the TAC by any of the IOs sponsored by any of the three supporting agencies.

2.4.4.2 Common Operations Development Environment
The Common Operations Development Environment (CODE) is an RPG algorithm development environment for the WSR-88D. CODE contains the software and documentation to facilitate and guide algorithm development. It allows a developer to create a non-operational “clone” of a WSR-88D RPG that can ingest archived data. CODE is maintained by the Office of Science and Technology. For more information visit the website WSR-88D CODE: The Common Operations and Development Environment.

2.4.4.3 Transfer Of RPG Science
The process for including new algorithms into the WSR-88D baseline is described in WPI0037, Transfer Of RPG Science To The ROC.

2.5 Testing
ROC/SWE is responsible for conducting initial tests on all newly developed software prior to Formal Testing by ROC Radar Systems Test (ROC/RST). The tests performed by ROC/SWE are described below.

2.5.1 Test Procedures
SWDs will develop test procedures on all newly developed and updated software. These procedures will be documented in applicable Razor Issues.

2.5.2 Testing Phases

2.5.2.1 Unit Testing
SWDs perform Unit Testing on all newly developed and updated software prior to introducing into Razor for inclusion in the WSR-88D baseline. What constitutes a “Unit Test” will be determined by each SW Group Lead. The methodology and results of unit testing is documented in the applicable Razor Issues and may be used during later levels of testing. After inserting changes into the baseline via Razor (a process called “checking-in”), the SWD will perform tests to verify all source code relating to the change was successfully introduced into the software baseline. Test methodologies and results will be documented in applicable Razor Issues. Once the SWD has completed Unit Testing, they will update applicable Razor Issues by entering “RFT” in the status block to indicate that it is “Ready For Test” by the SW Testers (SWTs).

2.5.2.2 Integration And Regression Testing
Integration and Regression Testing is a ROC/SWE function. Any critical or major defect identified during Integration and Regression Testing will be resolved by ROC/SWE before the start of Formal Testing by ROC/RST. Other defects or problems identified will be resolved and corrected on a case by case basis.
2.5.2.2.1 Integration Test Readiness Review
The Integration Test Readiness Review (ITRR) is a meeting between SWDs and the SWTs. The purpose of the ITRR is to review all software changes, Unit Test methodologies and results, and associated documentation.

2.5.2.2.2 Integration Testing
SWTs perform Integration Tests in accordance with pre-defined test procedures. Integration tests are performed to ensure all changes result in software behavior that is correct and expected. Once SWTs complete their Integration Tests, they will update applicable Razor Issues by entering “COMP” in the status block to indicate testing has been “Completed”.

2.5.2.2.3 Regression Testing
SWTs will perform Regression Tests in accordance with applicable Regression Test Plans (RTPs). RTPs are updated as required for each software baseline. Regression tests are performed to verify previously existing functionality is carried forward.

2.5.2.2.4 Product Regression Testing
Product Regression Testing (PRT) is performed to verify that previously created RPG products are not affected by new software changes. PRTs will cover all products defined in 2620001, ICD For The RPG To Class 1 User.

2.5.3 Test Reports
SWTs will document the results of all testing.

2.5.3.1 Unit Test Report
The results of Unit Tests are documented in applicable Razor Issues. No formal Unit Test Report is required.

2.5.3.2 Integration Test Report
The Integration Test Report will describe all CCRs and associated Razor Issues that were tested, the results of each test, and any anomalies encountered during testing. This report should be made available to ROC/RST prior to the System Test Readiness Review.

2.5.3.3 Regression Test Report
The Regression Test Report will describe all tests performed and their results. This report should be made available to ROC/RST prior to the System Test Readiness Review.

2.6 Documentation
ROC/SWE will work with the ROC Documentation section to make any required updates to WSR-88D Technical and Operator’s Manuals as the result of changes to the WSR-88D software baseline. SWDs will provide any information needed and assist as required in filling out Publication Change Requests (PCRs) and Documentation Change Requests (DCRs).

2.6.1 Source Code
SWDs will include comments in their developed source code to improve readability and maintainability. Comments are to be in accordance with applicable coding standards.

2.6.2 Technical Data
The Technical Data Management Plan identifies requirements and establishes policies and responsibilities necessary to control, store, retrieve, update, and track WSR-88D Technical Data, including Technical
2.6.2.1 Baseline Specifications
WSR-88D baseline documentation consists of all documents, technical data, lists, specifications, and standards needed to control and manage the NEXRAD hardware and software products. For more information on baseline specifications, refer to Technical Data Management Plan, ROCPLN-PGM-04.

2.6.2.1.1 System Specification
The WSR-88D System Specification (SS) establishes the performance, design, development and test constraints for the WSR-88D weather radar system by defining the system requirements called ‘shall(s)’. For more information, refer to 2810000, WSR-88D System Specification.

2.6.2.1.2 System/Subsystem Design Description
The WSR-88D System/Subsystem Design Description (SSDD) assigns responsibilities to hardware and software authorities. One of the main functions of the SSDD is to allocate system requirements from the SS to hardware components or software components, and then for the software, further allocation to the RDA, RPG and System subsystems. For more information, refer to 2830013, WSR-88D System/Subsystem Design Description.

2.6.2.1.3 Software Requirements Specification
The Software Requirements Specification (SRS) establishes requirements for performance, design, test and qualification of a computer software program. These requirements called “shall(s)” are allocated to the SRS by the SSDD; they provide proof that system requirements delineated in the SS are implemented in the application software through the use of a traceability matrix. The SRS is the document for a SWD to find what requirements are implemented (or needs to be implemented) in the software. Refer to the Technical Data Management Plan, ROCPLN-PGM-04 for more information and a list of applicable SRSs.

2.6.2.1.4 Software Design Description
The Software Design Description (SDD) establishes the design of the computer program. The SDD contains design descriptions, the architectural design and concepts of execution, and the detailed design of the application software. The SDD is the document for a SWD to find how the application software is organized and its hierarchical structure. Refer to the Technical Data Management Plan, ROCPLN-PGM-04 for more information and a list of applicable SDDs.

2.6.2.1.5 Software Product Specification
The Software Product Specification (SPS) provides instructions for creating executable software programs from the source files. It also provides instructions on how to perform software modifications beyond what is apparent in the SDD. The SPS is the document for a SWD to find instructions on how to edit and compile the application software to create executable code. Refer to the Technical Data Management Plan, ROCPLN-PGM-04 for more information and a list of applicable SPSs.

2.6.2.1.6 Software Version Description
The Software Version Description (SVD) is the document that lists all the source code files for all the components in the current software Build. It also provides an inventory of all enclosed materials (digital media), all source code materials (files), and all CCRs that are implemented in this particular build. SVDs are maintained by ROC/CM in Agile. Refer to the Technical Data Management Plan, ROCPLN-PGM-04 for more information and a list of applicable SVDs.
2.6.2.2 Manuals, Instructions & Training Material
SWDs will work with the ROC Documentation section and the Warning Decision Training Branch to update any system and maintenance manuals, instructions, and training material that may require updates as the result of changes to the WSR-88D software baseline. SWDs will provide any information needed and assist as required in filling out PCRs and DCRs.

2.6.2.3 Interface Control Documents
ICDs define data communication between various NEXRAD systems, sub-systems, and external systems. Updates to ICDs are the responsibility of the SWD. Refer to the Technical Data Management Plan, ROCPLN-PGM-04 for more information and a list of applicable ICDs.

2.6.2.4 Software Test Documentation
SWDs will document the preparations, procedures, and results of all testing performed during software development and maintenance in applicable Razor Issues. ROC/RST will document qualification testing in Software Test Descriptions (STDs) and Software Test Reports (STRs).

2.6.2.4.1 Software Test Description
The STD describes the test preparations, cases and procedures to be used in performance of qualification testing of a CPCI or software system, or subsystem. ROC/RST is responsible for preparing STDs in accordance with J-STD-16. For more information, refer to the Technical Data Management Plan, ROCPLN-PGM-04.

2.6.2.4.2 Software Test Report
The STR is a record of qualification testing performed on a CPCI, system, or subsystem. ROC/RST is responsible for preparing STRs in accordance with J-STD-16. For more information, refer to the Technical Data Management Plan, ROCPLN-PGM-04.

2.7 Release

2.7.1 Introducing Source Code To Razor
All source code changes are checked in to Razor by the SWD. For some systems, once System Testing has begun, only ROC/CM may check in changes.

2.7.2 Update Status
The SWD will provide status updates at various stages of the software development process in the applicable Razor Issue.

2.7.3 Software Released For Formal Test
Upon successful completion of Integration and Regression Testing, the ROC/SWE Team Lead will deliver the Integration and Regression Test Reports to ROC/RST and inform them the software baseline is ready to begin formal testing. The ROC/SWE Team Lead may delegate this authority to the ROC/SWE Group Leads. ROC/RST will schedule and conduct a System Test Readiness Review.
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3.0 SYSTEM LIFECYCLE
This section describes the overall system lifecycle process for the WSR-88D.

3.1 Project Documentation

3.1.1 Work Practice Instructions
A WPI is a defined process for executing a particular task. NEXRAD WPIs can be found in Agile.

3.1.2 Requests For Change
The CM Section of the NWS Office of Climate, Water, and Weather Services is responsible for documentation, coordination, and tracking of NWS RCs. NWS CM staff coordinates the review of RCs for major NWS operational hardware, software and data product systems (including AWIPS and NEXRAD) in accordance with NWS Instruction 10-101, NWS Change Management Process. For more information, refer to the NWS CM Section website.

3.1.3 Engineering Change Proposals
A NEXRAD Engineering Change Proposal (ECP) is a management tool used to propose a configuration change to the WSR-88D baseline. An ECP is required for any change to WSR-88D hardware, software, performance specifications, and documentation. A request is made at a TRC meeting to remove a CCR from the System Project Pool, which will then become an ECP. The TRC assigns team members to work each ECP.

3.1.3.1 ECPs Costing Less Than $100,000
The process for ECPs costing less than $100,000 is described in WPI0003, (ENG) ECP Origination Instructions and Workflow – Under $100,000.

3.1.3.2 ECPs Costing $100,000 to $1,000,000
The process for ECPs costing between $100,000 and $1,000,000 is described in WPI0004, (ENG) ECP Origination Instructions and Workflow - $100,000 To $1,000,000.

3.1.4 Configuration Change Requests
A NEXRAD CCR documents a request to make changes to the WSR-88D baseline. CCRs are managed using Agile in accordance with WPI0001, Tri-Agency Change Process In Agile.

3.1.4.1 System Configuration Change Request
Changes to the NEXRAD hardware or database baselines maintained by the ROC must be preceded by an approved System CCR. System CCRs are used to track requested changes through the system maintenance process and must be approved by the Configuration Control Board (CCB). If a System CCR requires changes to the NEXRAD software baseline, a separate SW CCR must be created to implement the changes to the software baseline. System CCRs will be created in accordance with WPI0002, Agile – (ENG) System CCR Workflow Instructions.

3.1.4.2 Software Configuration Change Request
Any change to the NEXRAD software baselines maintained by the ROC must be preceded by an approved SW CCR. Refer to Section 2.1.2 for more information on SW CCRs.
3.1.5 Issues
The Razor Issues database is used to track areas of concern identified during testing as well as changes to the WSR-88D software baseline. Issues generated from testing which have been investigated and proven to identify software defects must be converted to a SW CCR. A corresponding SW Issue will be created by CM in the appropriate software database. The SW CCR must be approved and the SW Issue must be “activated” by ROC/CM before software changes may be checked in by the SWD to the correct problem. The process for submitting issues by government and contractor personnel outside of ROC/SWE is described in WPI0043, WPI for Issuing Problem Reports to Software Engineering.

3.2 Committees & Review Boards

3.2.1 NEXRAD Program Management Committee
Oversight of the NEXRAD program budget, policy, resource commitment, and management guidance is provided by the NEXRAD Program Management Committee (PMC) throughout the life cycle of the WSR-88D program to ensure that both common and unique agency requirements are addressed and resolved. The PMC shall also serve as a higher level CCB for proposed major product improvement changes that affect the WSR-88D system configurations operationally deployed within the three agencies. In this regard, the PMC has the authority for authorizing changes to the NEXRAD product baselines. Routine operational and configuration management issues shall be staffed and resolved among the agencies to permit the PMC to focus on major product improvements and network performance issues. For more information, refer to the WSR-88D Program Management Committee Charter.

3.2.2 Technical Advisory Committee
The TAC will prioritize technical needs on an annual basis, giving consideration to the feasibility of the Research and Development (R&D) required. This process will involve discussions with individuals and groups contributing to WSR-88D R&D. For further information, refer to the NEXRAD Technical Advisory Committee (TAC) In Support Of The Next Generation Weather Radar (WSR-88D) Charter.

3.2.3 Technical Review Committee
The TRC is the first step in the SW CCR approval process. The TRC is hosted by ROC/CM and is responsible for evaluating SW CCRs and making a recommendation to the SREC. Presentation of the CCR to the TRC allows discussion and resolution of any questions or concerns. The SREC has given permission for the TRC to adjudicate CCRs for minor enhancements to infrastructure and assign them to a targeted build. The TRC committee meets on an “as necessary” basis and publishes to all ROC Engineering and Programs Branch staff members. For more information, refer to WPI0045, Agile Software CCR Instructions and the Technical Review Committee Charter.

3.2.4 Software Requirements and Evaluation Committee
The SREC as a tri-agency committee that reviews and recommends changes to the WSR-88D software baseline. The SREC is responsible for the evaluation and prioritization of SW modifications for integration into the WSR-88D SW baseline; recommending the contents and schedule for WSR-88D SW builds to the PMC; and facilitating enhanced communication, cooperation, flexibility, and discipline among the tri-agencies required by a shorter build cycle. While the SREC has delegated some authority to the TRC, SW CCRs for major enhancements must be approved and targeted to a build by the SREC. For more information, refer to WPI0045, Agile Software CCR Instructions and the NEXRAD Software and Evaluation Committee (SREC) In Support Of The Weather Surveillance Radar-1988 Doppler (WSR-88D) Charter.

3.2.5 Test Review Board
The Test Review Board (TRB) is the committee hosted by the ROC/RST that meets “as necessary” during formal Software Build Testing to evaluate issues in the Razor Issues database. The TRB determines the
active status of each Razor Issue, approves/disapproves recommendations on handling the Issue, and sets suspense dates. If an issue is approved, it is activated, and a CCR is normally generated and future software build or a software drop is assigned. For more information, refer to the WSR-88D Test Review Board Charter.

3.2.6 Build Review Board
The Build Review Board (BRB) is charged with the responsibility for defining and scheduling Update or Point software releases. The objective of the BRB is to establish a process that will allow ROC personnel and external stakeholders the opportunity to provide input and be directly involved in the decision-making process of formalizing “Update” or “Point Release” content and testing and deployment schedules when minor Build releases become necessary. The roles and responsibilities of BRB members are outlined in WPI0042, Instructions for Build Review Board Roles and Responsibilities.

3.2.7 Configuration Control Board
The CCB maintains a systematic change management process that regulates life cycle costs, optimizes design and development with configuration change control procedures, provides efficient application of configuration changes, controls configuration documentation, and eliminates unnecessary changes. The CCB and PMC are the approval authorities for Class I ECPs designated for a Software Release. The CCB only reviews or approves site specific adaptable parameters when requested by an agency. For more information, refer to the WSR-88D Configuration Control Board Charter, OSFPLN-SSB-06.

3.2.8 Adaptable Parameters Working Group
The Adaptable Parameters Working Group (APWG) is the ROC committee whose responsibility it is to evaluate and approve changes to the WSR-88D system adaptation data parameters. Any CCRs that involve changes to adaptation data must be reviewed and approved by voting members of the APWG before implementation can take place. For more information, refer to the WSR-88D Adaptable Parameters Working Group Charter.

3.2.9 Communications and Networks Working Group
The Communications and Networks Working Group (CNWG) has the responsibility of planning, oversight, and direction of the NEXRAD and PUP Program’s communications and networking policies, decisions, and guidance throughout the lifecycle of the programs to ensure common and unique agency requirements and long term support are fully addressed and resolved in the most cost-effective and timely manner. The CNWG shall review CCRs and ECPs related to communications and network system configurations prior to submission, and serve as an advising voice to the TRC for proposed changes that affect the NEXRAD and PUP Program’s communication and network system configurations. For more information, refer to the Communications And Networks Working Group Charter.

3.2.10 Test Bed Working Group
The ROC/RST Team Lead is Chairman of the Test Bed Working Group (TBWG). Membership of the TBWG includes the Operations Branch Chief, all ROC Team Leaders, and key personnel from special projects teams. The TBWG meets quarterly. The Chairman schedules the meetings, prepares the agenda and notifies individuals of the meeting and agenda items. The Chairman prepares and distributes the minutes and actions from each meeting. The Chairman coordinates review of Test Bed Change Requests with TBWG members and approves or disapproves the request to modify Test Bed hardware. For more information, refer to ROC Directive DIR-36, Test Bed Access & Configuration Control and the WSR-88D Test Bed Working Group Charter.

3.2.11 Operations and Services Improvement Process
The OSIP was established as a form, consistent, responsive, and user-focused requirements-based process to enable the NWS to identify, prioritize, and manage needs and opportunities for operations and services improvements based on mission relevance. The process enables the NWS to develop and implement
responsive, scientifically and technically sound, secure, and cost-effective solutions which meet requirements. OSIP is an NWS only process and does not supplant the authority of the SREC and does not constitute tri-agency approval. For more information, refer to National Weather Service Policy Directive 10-1, Operations and Services, NWS Requirements, Operations, And Services Improvements.

3.3 Tools And Applications

3.3.1 Agile
Agile serves as the repository for the final version of Product Baseline documentation for both hardware and software. Agile is used to control and track the status of all CCRs, ECPs, DCRs, PCRls, WPIs, Modification Change Notices, deviations, waivers, and other types of WSR-88D Technical Data. Refer to Technical Data Management Plan, ROCPLN-PGM-04 for more information.

3.3.2 Razor
Razor is used to manage WSR-88D software source code and formally track all software changes. Refer to Technical Data Management Plan, ROCPLN-PGM-04 for more information.

3.3.3 DOORS
DOORS is used to manage requirements and documentation throughout the life of a project. DOORS contains system and subsystem documentation such as ICDs and SDDs. One of the main advantages of DOORS is that it allows for linkage between documents (similar to html) so that traceability can be created and maintained. Refer to Technical Data Management Plan, ROCPLN-PGM-04 for more information.

3.4 Formal Testing
All formal testing will be conducted by ROC/RST. All System Tests and Operational Tests will be conducted in the ROC Test Bed. Any problems identified during Formal Testing will be documented by ROC/RST as an Issue in Razor. TRBs are held periodically during Formal Testing to discuss Issues and their disposition. ROC/SWE will support formal testing by making SWDs available as required to review test results, data, and procedures. SWDs will assist in the investigation of any inconsistencies identified during formal testing.

3.4.1 System Testing
System Testing involves component testing of the newly developed WSR-88D software for the RDA, RPG and PUP, and also includes end-to-end testing. All Issues identified during System Testing will be corrected or deferred by the TRB at a System Test Wrap-Up Meeting before continuing to Operational Testing.

3.4.2 Operational Testing
Operational Testing is performed to evaluate the operational effectiveness and suitability of the software in a simulated operational environment. The focus of operational testing is on the complete WSR-88D system, including software installation instructions, software and hardware documentation, and training materials. Additionally, the software load procedures, stability of the software, and stability of narrowband and wideband communications are verified. All Issues identified during Operational Testing will be corrected or deferred by the TRB at an Operational Test Wrap-Up Meeting before continuing to Beta Testing.

3.4.3 Beta Testing
Beta Testing involves loading the newly developed software build at select radar field sites and observing software performance during a Beta Use period of 14 to 30 days. ROC/RST personnel start Beta Testing on site by installing the software build. Once installed, ROC/RST returns to the ROC and testing continues in an operational environment under the direction of site personnel. The main purpose of a Beta test is to allow the software to operate under configurations and conditions that cannot be simulated in the ROC Test
Bed. At the conclusion of Beta Testing, the TRB conducts a Beta Test Wrap-Up Meeting to determine if fleet-wide deployment should commence.

3.5 Software Release
Once a software build has passed Beta Testing, ROC/CM will begin a scheduled release of the software build to field sites.

3.6 Technical Support
WSR-88D users may report problems, request support, and provide feedback on WSR-88D software in a number of ways.

3.6.1 WSR-88D Hotline
The WSR-88D Hotline provides 24 hour-a-day, 7 days-a-week support to all United States (US) Government Field Sites and other US Government users. This support includes interpretation of data, operations, maintenance, software, adaptation data, communications, and documentation. Hotline personnel are also available for on-site assistance when requested.

3.6.2 RTI Process
The purpose of an RTI is for the ROC Hotline to obtain rapid technical assistance from the ROC Engineering branch to problems identified in the field using a documented process. The RTI Process is outlined in WPI0046, Work Practice Instruction For Engineering Branch RTI Processing.

3.6.3 External User Problem Report

3.6.3.1 FAA Users
FAA users may create an FAA Casefile which will be converted to an Agile SW CCR.

3.6.3.2 NWS Users
NWS users (external to the ROC) may create an NWS RC which will be converted to an Agile SW CCR.

3.6.3.3 DOD Users
DOD users may submit an Agile SW CCR.

3.6.4 Security Notifications, Patches & Updates

3.6.4.1 Emergency System Security Patch Process
The Emergency System Security Patch Process (ESSPP) enables the ROC to address a situation where an emergency system patch is required. The ESSPP is a process internal to the ROC and specific to NEXRAD. The ESSPP applies to commercial-off-the-shelf products. The ESSPP is outlined in WPI0040, Emergency System Security Patch Process.

3.6.4.2 Application Software Security Process
The Application Software Security Process (ASSP) describes how ROC/SWE will respond to security vulnerabilities found in WSR-88D application software. The ASSP only applies to the ROC/SWE developed application software of the RDA, RPG, and PUP. The ASSP is outlined in WPI0042, Instructions for Build Review Board Roles and Responsibilities.
## 4.0 ADDENDUM

### 4.1 List Of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>APWG</td>
<td>Adaptable Parameters Working Group</td>
</tr>
<tr>
<td>ASSP</td>
<td>Application Software Security Process</td>
</tr>
<tr>
<td>AWIPS</td>
<td>Advanced Weather Interactive Processor System</td>
</tr>
<tr>
<td>BRB</td>
<td>Build Review Board</td>
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<tr>
<td>CCB</td>
<td>Configuration Control Board</td>
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<tr>
<td>CCR</td>
<td>Configuration Change Request</td>
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<td>CM</td>
<td>Configuration Management</td>
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<tr>
<td>CNWG</td>
<td>Communications and Networks Working Group</td>
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<td>CODE</td>
<td>Common Operations Development Environment</td>
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<td>CPCI</td>
<td>Computer Program Configuration Item</td>
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<td>DAR</td>
<td>Design Approach Review</td>
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<td>DCR</td>
<td>Documentation Change Request</td>
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<td>DOC</td>
<td>Department Of Commerce</td>
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<tr>
<td>DOD</td>
<td>Department Of Defense</td>
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<tr>
<td>DOORS</td>
<td>Direct Object-Oriented Requirements System</td>
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<td>ECP</td>
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<td>FAA</td>
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<td>ICD</td>
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<td>IO</td>
<td>Implementing Organization</td>
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<td>ITRR</td>
<td>Integration Test Readiness Review</td>
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<td>NEXRAD</td>
<td>Next Generation Radar</td>
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<td>NWS</td>
<td>National Weather Service</td>
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<td>OSIP</td>
<td>Operations and Services Improvement Process</td>
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<td>Principal User Processor</td>
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<td>R&amp;D</td>
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<td>RDA</td>
<td>Radar Data Acquisition</td>
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<td>Radar Product Generator</td>
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<td>Radar Systems Test section</td>
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<td>RTI</td>
<td>Request for Technical Information</td>
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<td>RTP</td>
<td>Regression Test Plan</td>
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<tr>
<td>SDD</td>
<td>Software Design Description</td>
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<td>SPS</td>
<td>Software Product Specification</td>
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<td>SREC</td>
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<td>SRS</td>
<td>Software Requirements Specification</td>
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<td>SS</td>
<td>System Specification</td>
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<tr>
<td>SSDD</td>
<td>System/Subsystem Design Description</td>
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<td>STD</td>
<td>Software Test Description</td>
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<td>STR</td>
<td>Software Test Report</td>
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<td>SVD</td>
<td>Software Version Description</td>
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<td>SW</td>
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<td>SWD</td>
<td>Software Developer</td>
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<td>Abbreviation</td>
<td>Description</td>
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<td>Software Tester</td>
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<td>Software Test Bed</td>
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<td>TAC</td>
<td>Technical Advisory Committee</td>
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<td>TRB</td>
<td>Test Review Board</td>
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<td>TRC</td>
<td>Technical Review Committee</td>
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<td>US</td>
<td>United States</td>
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<td>WPI</td>
<td>Work Practice Instruction</td>
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<td>WSR-88D</td>
<td>Weather Surveillance Radar of 1988 Doppler</td>
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</tbody>
</table>
4.2 Bibliography
All referenced material is maintained by the ROC unless otherwise indicated.

4.2.1 Radar Operations Center Work Practice Instructions
- WPI0001, Agile – Tri-Agency Change Process (Agile)
- WPI0002, Agile – (ENG) System CCR Workflow Instructions. (Agile)
- WPI0003, (ENG) ECP Origination Instructions and Workflow – Under $100,000. (Agile)
- WPI0004, (ENG) ECP Origination Instructions and Workflow – $100,000 To $1,000,000. (Agile)
- WPI0012, Agile – (ENG) ROC (NWS) RC Originator Instructions. (Agile)
- WPI0037, Transfer Of RPG Science To The ROC. (Agile)
- WPI0042, Instructions For Build Review Board Roles And Responsibilities For The Dot Build Policy. (Agile)
- WPI0043, WPI for Issuing Problem Reports to Software Engineering. (Agile)
- WPI0045, Agile Software CCR Instructions. (Agile)
- WPI0046, Work Practice Instruction For Engineering Branch RTI Processing. (Agile)
- WPI0051, RPG C Coding Standards. (Agile)

4.2.2 Radar Operations Center Charters
- NEXRAD Technical Advisory Committee (TAC) In Support Of The NEXRAD WSR-88D (WSR-88D) Charter. (ROC Web Site)
- Communications And Networks Working Group Charter. (Agile)
- WSR-88D Adaptable Parameters Working Group Charter. (TBD)
- WSR-88D Configuration Control Board Charter, OSFPLN-SSB-06. (ROC Web Site)
- WSR-88D Program Management Committee Charter. (Agile)
- WSR-88D Technical Review Committee Charter. (TBD)
- WSR-88D Test Review Board Charter. (TBD)
- WSR-88D Test Bed Working Group Charter. (TBD)

4.2.3 Radar Operations Center Descriptions
- 2830013, WSR-88D System/Subsystem Design Description. (Agile)

4.2.4 Radar Operations Center Directives
- ROC DIR-36, Test Bed Access & Configuration Control. (TBD)

4.2.5 Radar Operations Center Interface Control Documents
- 2620001, Interface Control Document For The RPG To Class 1 User. (Agile)

4.2.6 Radar Operations Center Plans
- RDA Software Development Plan (SDP), OSTPLN-ORDA-002. (DOORS)
- Technical Data Management Plan, ROCPLN-PGM-04. (Agile)

4.2.7 Radar Operations Center Specifications
- 2810000, WSR-88D System Specification. (Agile)
4.2.8 National Weather Service Directives and Instructions


4.2.9 Web Sites

- NWS CM Section: [www.weather.gov/os/cm](http://www.weather.gov/os/cm)
- NWS Directives: [www.nws.noaa.gov/directives](http://www.nws.noaa.gov/directives)
- Radar Operations Center: [www.roc.noaa.gov](http://www.roc.noaa.gov)