5.12 Near Term Planned Mission Enhancements for the WSR-88D Open Radar Data Acquisition System

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1. INTRODUCTION

The Open Systems Radar Data Acquisition (ORDA) will provide an initial build with functionality equivalent to that of the legacy RDA while providing the foundation for rapid enhancements in future builds. The controlled scope of the initial build will enable rapid development and test, and a deployment beginning in late calendar year 2004. Fortunately, implementing legacy RDA functionality within the context of the modern technology of ORDA will enhance mission performance in several areas.

The status of the ORDA project is described in Saffle et al. (2002) and the design of the ORDA is provided by Zahrai et al. (2002). This paper will describe WSR-88D mission enhancements that the initial build of the ORDA is expected to bring.

2. MISSION PERFORMANCE ENHANCEMENTS

2.1 Accurate Time Stamps

The ORDA clocks will be automatically and periodically synchronized to the Atomic Clock. This will assure base data time stamps are always accurate, will eliminate downtime and labor to manually set clocks, and will solve multi-radar product mosaic problems. It also provides the opportunity to investigate the feasibility of an operational bistatic multiple Doppler network (Wurman et al., 1993).

2.2 Archive Level II Device Location

The full Level II Archive datastream (including Metadata) will be provided to the Radar Products Generator (RPG). Metadata provides data quality information such as clutter filter settings, Volume Coverage Pattern parameters, Performance/Maintenance data, and adaptable parameter settings. With this architecture Level II recording can be done at the Radar site, RPG, the NWS Weather Forecast Office, or at a central site such as the National Climatic Data Center.

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2.3 Correct Spectrum Width Bias

The calculation for spectrum width will be improved to correct noise induced biases.

2.4 Eliminate Bulls-Eye Pattern

Radar calibration methods will be simplified by preventing the flow of base data to the RPG during the CW Substitution Reflectivity Error check. This will eliminate the bulls-eye pattern that has occurred (Albertelly, 1999) in products when this calibration procedure is performed.

2.5 Volume Coverage Pattern (VCP) Storage

There will be greater storage capacity for additional Volume Coverage Patterns (VCP). The legacy RDA is limited to just four VCPs. ORDA will provide the flexibility to expand upon these four so that new VCPs under development can be executed from the ORDA.

2.6 RDA System Operability Test (SOT) Function

Improvements to the SOT functionality include improved clutter map generation, streamlined calibration, shared software modules, and remote access.

2.6.1 Clutter Bypass Map Generation

The clutter bypass map will be generated while scanning the antenna instead of stopping the antenna at each azimuth position. This will reduce the map generation time from 2 hours to approximately 15 minutes. This will make the clutter map more representative of clutter during operational VCPs, since the antenna motion will be consistent between map generation and its use. The system may also be designed to store more than one clutter bypass map so that weather or seasonal dependent maps are readily available for use.

2.6.2 Streamlined Calibration

Calibration procedures will be implemented to retain intermediate calibration parameters during the process. This will free technicians from reentering them, reducing effort and potential for human error.

2.6.3 Shared Software Modules

The radar test and operational software will use shared software modules. Using shared modules will enable the radar test software to better diagnose problems that have been difficult to detect, and will enable additional tests on the operational data stream.

2.7 Graphical User Interface (GUI)

The GUI for ORDA will provide many advantages. It will simplify command and control, reduce training requirements, reduce effort, and provide graphic displays of alarms and notifications.

2.7.1 Intuitive

The GUI will be intuitive and will simplify procedures since technicians won't have to re-read lengthy technical manuals to perform infrequent tasks.

2.7.2 Local Base Data Display

It will have a local display of base data that will enable technicians to better judge the success of maintenance and calibration actions.

2.7.3 Simplified SOT Menu Structure

The SOT consists of diagnostic tests, calibration tests, and maintainability aids. A goal of the ORDA SOT is to provide a complete set of options on a single screen. This will eliminate a process, drilling down through a complex multi-menu sequence to initiate an action.

2.7.4 Remote Access

The GUI can be accessed at the radar shelter, at the Master System Control Function (MSCF), or remotely (e.g., dial-in capability from a laptop computer). Remote access to ORDA (including SOT functions) will allow technicians to monitor, troubleshoot, and perform routine maintenance from a convenient facility. This will reduce the need to travel to the radar site and better prepare technicians to resolve problems when they must go to the site.

2.7.5 MSCF Controls ORPG and ORDA

The MSCF will provide a single point of control for both the RDA and RPG, and the look and feel of the RDA GUI will be consist with the RPG GUI.

2.8 Security Measures

Access to the ORDA will be controlled through user login to eliminate unauthorized changes to system parameters. ORDA will provide functional logs to record changes and updates to system parameters. An objective to the new system architecture is to upgrade security to respond to new and emerging threats.

2.9 Modern COTS Equipment, Operating Systems, Programming Languages, and Software Redesign

Maintainability and availability will increase with fewer Line-Replaceable-Units (LRUs). Use of multiple vendor COTS equipment will improve supportability and provide expandability with easier upgrades and add-ons. Development productivity will improve through use of a modern system development environment, and software maintainability will improve though use of higher level programming languages and improved modularity.

2.10 Future Capabilities

ORDA provides the framework for adding future system enhancements as described by Elvander et al. (2001) such as Dual-polarization, digital receiver, higher spatial resolution of base data, versatility in clutter filtered data, and further improvements in radar system performance monitoring and calibration.

3. SUMMARY

ORDA provides needed upgrades to NEXRAD's RDA subsystem to create an Open Systems Architecture. The new architecture will support advances in technology since the legacy RDA was designed in the mid-1980's, incorporates experience gained by using and maintaining the system, and provides the opportunity meet both today's and the future needs of the WSR-88D.

4. REFERENCES

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