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EXPERIENCES WITH THE EARLY DEPLOYMENT OF THE WSR-88D OPEN RADAR PRODUCT GENERATOR (ORPG)

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1. BACKGROUND

The Weather Surveillance Radar-1998 Doppler (WSR-88D) Open Radar Product Generator (ORPG) has been under development for several years. Progress has been reported in several IIPS Conference Preprints (Belville et al. 1997; Crum et al. 1998; Reed et al. 1999, Reed et al. 2000). In the 17th IIPS it was reported the manufacturer of the selected communications hardware ceased operations, causing development delays (Reed et al. 2001). As of the 17th IIPS, the ORPG project was ready to begin final development testing, but the Radar Operations Center (ROC) modified the test strategy significantly to mitigate overall schedule impact caused by the need to develop a new communications solution. ORPG testing is now in the final stages, while at the same time the ROC has begun deployment of some field ORPGs. This paper provides an update on overall ORPG project status and initial field experience.

2. ROC ORPG PROJECT STATUS

ORPG Communications Design Changes: Work on a new communications hardware solution is now complete. As previously reported, the new narrowband hardware is the Performance Technology Incorporated (PTI) MPS 800 while the wideband gateway to the Radar Acquisition Unit (RDA) T1 interface is based on the Polycom ACE360 communications card. Field testing revealed the wideband gateway needs to be coupled with an external Communications Service Unit (CSU) so loopback tests can be executed on commercial T1 lines. The result is that a CSU has been added to ORPGs with commercial T1 lines to distant radar sites.

ORPG Testing: The ROC split ORPG testing into two phases to mitigate schedule delays. Initially, ROC conducted system and acceptance tests on the least complex and most common ORPG configuration. This configuration applies to approximately half of the fielded WSR-88D radars--all being at National Weather Service (NWS) locations. Once this testing was complete and as deployment of the most common ORPG configuration began, the ROC continued system and acceptance testing of the less common, and more complex, configurations found at remaining NWS, Department of Defense (DoD) and Federal Aviation Agency (FAA) WSR-88D sites. Testing is now nearing completion. Final testing did result in a few software changes that will be retrofitted on previously fielded ORPGs, as well as on future ORPG installations.

ORPG Assembly: Using contract augmentation, the National Reconditioning Center (NRC) is assembling field ORPGs. The process begins with NRC staff loading software and configuring ORPG hardware with correct IP addresses and strapping. The configured hardware is then installed in cabinets and tested before being turned over to the National Logistics Support Center (NLSC) for storage and shipping.

ORPG Deployment: Teams from Hill Air Force Base are installing the tested ORPGs at field sites. The ROC developed step-by-step Installation and Checkout (INCO) procedures for the installation teams. ROC staff trained the INCO Teams using the procedures and also demonstrated rudimentary ORPG trouble shooting techniques. In case an INCO team encounters a problem beyond their capabilities, the problem is reported to the ROC hotline for resolution.

ORPG Operations Training: The Warning Decision Training Branch (WDTB) is providing distance learning for NWS field operators. Training CDs are sent to p field sites in advance of site installation. Selected site staff then participate in on-line training sessions to learn basic

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ORPG operation. Remaining site staff are then trained by the on-site staff who attended the on-line training sessions. Thus far, the feedback on this training has been very positive.

ORPG Maintenance Training: The National Weather Service Training Center (NWSTC) at Kansas City, MO developed an ORPG "delta" training course. This six-day course teaches experienced WSR-88D technicians how to maintain the new ORPG. The National Weather Service (NWS), the Federal Aviation Administration (FAA) and the Air Force are sending site technicians to this course as ORPGs are installed at individual sites. In the meantime, the NWSTC and Air Education Training Command (AETC) at Keesler Air Force Base are incorporating ORPG maintenance training into WSR-88D maintenance courses so their new WSR-88D technicians will not need the ORPG "delta" training.

ORPG Deployment Management: The ROC has established an ORPG management team to coordinate assembly, shipping, schedules, INCO team arrival, problem solving and resolution of post installation issues. This team coordinates directly with sites and INCO teams until ORPG installation begins at a site. After that time, problems are reported through the WSR-88D hotline so the ROC can compile a data base of ORPG problems and solutions using existing hotline automated tools. If the hotline staff cannot solve a problem directly with the INCO team, they refer the problem to the ORPG deployment management team for action. Once the issue is resolved, the actions taken are reported back via the hotline so information on the problem resolution is available for future hotline use.

3. USER SATISFACTION WITH ORPG

The legacy RPG user interface is text, menu and table based, making some key functions difficult to perform, especially during the stress of a severe weather event. Operator reaction to the ORPG user interface has been universally positive. Operators report the new Graphical User Interface (GUI) is intuitive and easy to use. New or improved features mentioned most frequently are as follows.

Status Information: In the legacy RPG, operators have to search among a variety of screens to determine the overall radar status. The ORPG has status boxes on the main menu and on other key screens showing operators significant status information without the need to search multiple screens.

Environmental Winds: The legacy RPG uses a time-consuming, manual entry edit table to adjust wind profiles. The ORPG GUI interface uses a point-and-drag display that allows users to accurately update the wind profile in seconds.

Clutter Regions: The legacy RPG requires access to various screens and menus to update clutter regions. ORPG users define clutter regions on a point and click screen. The overall status and a graphical representation of the defined clutter regions are shown on a user friendly screen so other users can easily understand what clutter suppression has already been invoked.

Pulse Repetition Frequency (PRF) Selection: WSR-88D operators can select different PRF rates to view significant meteorological data that may be obscured by range folding. Unfortunately, the legacy, text-based interface requires operators to "guess" at a different PRF without knowing if the new PRF will improve range folding at the area of interest or if other important data will be obscured. The ability to select the proper PRF requires a lot of training and experience so operators have confidence a PRF change will improve range folding rather than making the situation worse. The ORPG PRF selection capability feature provides the following improvements:

The ORPG PRF Selection Window is intuitive. It is graphical and everything can be done in a single window.

Users can easily resize, or otherwise change, individual sectors. In contrast, operators using the legacy RPG tend to change the maximum unambiguous range (MUR) for 360 degrees because of the time involved and the potential for errors when trying to define individual sectors with the legacy interface.

Before a new PRF is implemented, users can visually see the effect the PRF change will have on the ORPG display. It is easy to try different PRFs to determine which selection best displays velocities for a given storm. This "view before change" feature makes it easy to determine if a PRF change will obscure velocity information of other storms of interest.

The new PRF selection capability was dramatically demonstrated at Topeka, the first ORPG beta site. The site had a tornadic supercell about 100 nm from the radar, along with storms at 20 nm from the radar along the same radial. The velocities within the tornadic supercell were mostly range-folded using WSR-88D automatic PRF selection. The office turned off the AutoPRF, resized the sector to cover an area containing the supercell, tried different PRFs, checked other sectors

and invoked the new PRF. All this took less than two minutes with no surprises when the next volume scan started.

Electronic Performance Support System (EPSS) on line support: The ORPG EPSS is a modern "help" capability for operators. EPSS provides both information on theory of operation or details on how to perform a step or steps of given ORPG operational tasks. Additionally, the ORPG EPSS allows the user to decide how much or how little information is needed. The user can navigate sequentially through each step within a selected task, "jump" to particular steps with which they are less familiar, and/or access further information regarding a specific step through the use of hypertext links. The EPSS has proven to be a very popular operational feature.

4. SUMMARY

The best summary was provided by Lans Rothfusz, the Meteorologist in Charge at the Atlanta Weather Forecast Office (WFO), one of the ORPG Beta Test Sites: *"Let me put this in context of all the software and equipment we have been receiving in the past years. This is probably the best and most effective software and installation that we have had in many, many years...from the field vantage point, you could not do any better. My compliments to the ROC, NSSL, and anybody else involved with the development of this software and the implementation. Deploy!"*

5. REFERENCES

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