11.4 UPDATE ON THE IMPLEMENTATION OF THE NATIONAL WEATHER SERVICE'S RADIOSONDE REPLACEMENT SYSTEM

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1. INTRODUCTION

The National Weather Service (NWS) is developing the Radiosonde Replacement System (RRS) to replace its antiquated Microcomputer Automatic Radiotheodolite (Micro-ART) system, which has been in operation since the late 1980s. The RRS is comprised of a new Global Positioning System (GPS) tracking antenna referred to as the telemetry receiving system or TRS, 1680 MHz GPS radiosondes along with its Signal Processing System (SPS), and a new Windows 2000©-based workstation. In addition to the deployment of the RRS, a new surface weather observing system called the Radiosonde Surface Observing Instrumentation System (RSOIS), has been deployed at most of the approximately 85 locations in the NWS upper air.

The strategy for testing and deploying RRS at individual NWS upper air sites will be discussed in this paper.

2. GENERAL TEST STRATEGY

The NWS plans to test the RRS using a phased approach. System Tests (ST) will be conducted in two phases with Phase I having two parts ("IA" and "IB"). The following sections discuss the requirements for each phase of testing. ST Phase IA will verify the functional software requirements from the RWS Software Requirements Specification have been met to the satisfaction of NWS Management. ST Phase IB will simulate operational use of the RRS and will commence after successful completion of Phase IA. Thus, ST Phase IB is the capstone test ensuring the RRS is ready for deployment to field sites and can perform in a similar manner to the legacy system it is replacing.

Phase II will center on the actual installation of RRS at WFO-LWX (Sterling, Virginia, station 72403) and tested in a controlled, operational environment with the RRS used to produce official products. "Controlled, operational environment" in this context refers to Test Team members being on site and observing RRS operations as well as suggesting specific actions be performed to exercise the RRS to the maximum extent possible without effecting WFO-LWX's operational mission. The legacy upper air system computer will be removed from the WFO-LWX intact and installed at the SR&DC, giving the WFO-LWX the capability of reverting to the legacy system for official products in the event of a catastrophic RRS failure (i.e., a hardware or software problem which cannot be repaired within a reasonable amount of time).

Following the System Tests, NWS will be conducting an Operational Acceptance Test (OAT) at selected sites with the first article units. The purpose of OAT will be to validate system installation, evaluate system performance, and determine if any critical problems exist before full deployment commences.

3. RRS SYSTEM TESTING-IA

ST Phase IA testing was conducted over the summer of 2004 to validate upper air system requirements for the radiosonde, ground system, and associated hardware; and deficiencies found will be corrected throughout the fall in preparation for the next phase of testing.

4. RRS SYSTEM TESTING-IB

The purpose of ST Phase IB is to verify the RRS is fully functional in an operational sense, reliable when compared to the legacy system, products can be transmitted reliably to NWS internal users and external customers, and preparations are complete for installation at field sites. This phase of ST must meet the following objectives under operational field conditions:

a. Assess elements of the RRS deployment process (see Section 4) and the RRS Operations Contact Center.

b. Validate RRS can meet the functional requirements during a quasi-operational environment.

c. Exercise all RRS subsystem interfaces to other NWS systems [e.g., the Advanced Weather Interactive Processing System (AWIPS)/Local Data Acquisition Device (LDAD)] and back-up telecommunications.

d. Collect performance data for evaluating meteorological algorithms including the solar radiation correction and generation of coded messages (see Figure 1).

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e Collect data for use during the Reliability, Maintainability, and Availability (RMA) analysis using the Engineering Management Reporting System (EMRS).

f. Validate simulated end-to-end functionality to NCEP and NCDC and other NWS customers for their product verification of decoders and data bases (see Section 6).

g. Assess the operational usability of RRS-generated data and products by a limited set of operational forecast applications and through comparisons with MicroART using RAOB**, a commercial upper air analysis product (see Figure 2).

h. Evaluate the installation of security, software updates, and demonstrate the agency's ability to replace an RRS workstation with another one without impacting operations.

i. Assess operator/maintenance training and supporting documentation.

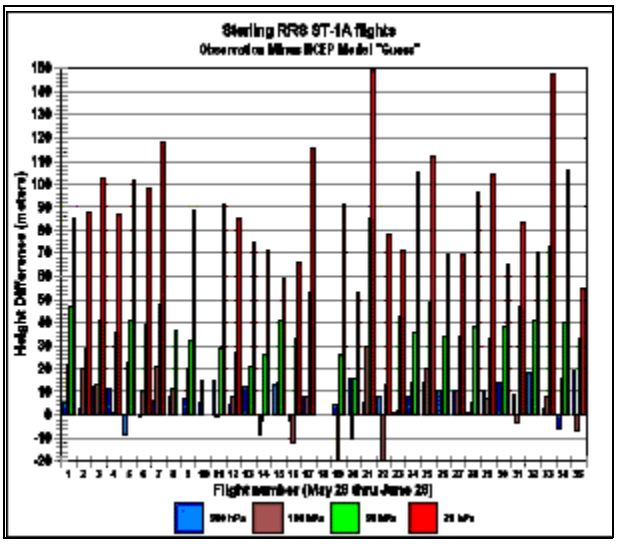

Figure 1. Example of NCEP Bias Product.

5. RRS DEPLOYMENT ACTIVITIES

Beginning with ST Phase II and OAT, the RRS will be deployed in a phased approach to the remaining 91 locations. The delivery of the ground system will be handled by International Met Systems of Grand Rapids, Michigan. A number of activities will take place at this time, including the installation of the TRS on top of the inflation building or other structure, stringing of cables to the field office and connecting them to the RRS workstation along with RSOIS. Note, the RSOIS and GPS repeaters inside the office environment will have already been installed at all locations before the start of this activity. Delivery of the new GPS radiosondes will also occur about this time to the NOAA Logistics Supply Center.

After system installation, which should only take a few days, the field staff will become familiar with the RRS, while the deployment team is testing the system. A series of non-synoptic test flights will be conducted and the telecommunications checked for verifying the throughput of upper air products to NWS offices and customers – refer to Section 6. This activity should conclude in less than a week. After testing is completed, the station is authorized to begin use of the RRS for synoptic observations. A message will be issued over NWS telecommunications notifying NWS customers of the RRS activation.

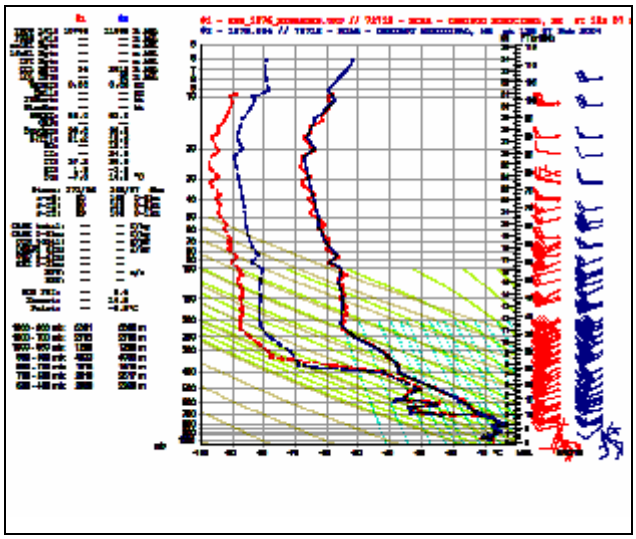

Figure 2. Example of RAOB Comparison.

6. TELECOMMUNICATIONS

In addition to the above tests, a detailed end-to-end telecommunications test will be conducted and coordinated with both NWS and non-NWS users. The purpose of this portion of the test will be to validate product throughput from KCAR via AWIPS/NOAAPORT to the NWS Telecommunications Gateway (NWSTG) for distribution to NWS customers. There are a small number of product differences between the legacy products and the RRS products which need to be tested with customer decoders and data bases.

** RAOB, the complete rawinsonde observation program, is produced by Environmental Research Services, ©, 1994-2002.

7. MESSAGE HEADERS

Test upper air messages issued over the telecommunications networks described above require test message headers to be appended to the products. This facilitates the transmission of these products over AWIPS and through the back-up communications line in accordance with the table below. The NWSTG will verify these products are being routed correctly to NWS customers and also verify they are being sent to NCEP.

Having the *ii*-portion of the header denoted as *97* prevents the products from becoming official, even though the contents will be actual data collected from the RRS. At some point in the process the *ii*-portion will resort to the same as KCAR's official one, except only those involved in the test will be ingesting the KCRT (station identified 69992) test header. In this way, users can determine the difference between the official MicroART products and RRS test products. Collectives as well as BUFR-coded versions will also contain both the MicroART and RRS products to test these variants.

8. CONCLUSION

The planning effort delineated in this paper is meant to educate the reader about the general NWS plans for deploying and testing the RRS. The testing process is used extensively within the agency to better prepare field units for the implementation of RRS in field operations and allows for a smoother transition by addressing/correcting operational issues and their impacts ahead of time. When implemented properly, the testing process has been very successful in ensuring technologies deployed by the NWS are meeting standards.

9. REFERENCES

U.S. Department of Commerce, NOAA: NWS National Directives System, NDS 80-2, Systems Commissioning and Decommissioning Policy.

National Weather Service, RRS Deployment Plan, V9.4, June 2003.

System Test Phase IB Plan for the RRS, September 2004, draft.

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AWIPS PIL	Individual Test WMO Header	Individual WMO Header	Collectives
CRTMANCRT	USUS97 KCRT	USUSii KCRT	USUS05 KWBC
CRTSGLCRT	UMUS97 KCRT	UMUSii KCRT	UKUS50 KWBC and UGUS50 KWBC
CRTABVCRT	UFUS97 KCRT	UFUSii KCRT	ULUS05 KWBC, UEUS05 KWBC, ULUS50 KWBC and UEUS50 KWBC
CRTFZLCRT	UXUS97 KCRT	UXUSii KCRT	UXUS70 KWBC
CRTULGCRT	NXUS97 KCRT	NXUSii KCRT	(Note, ULG product not required for this test)

BUFR Collectives: IUST41 KWBC, IUST42 KWBC and IUST46 KWBC