OPERATIONAL ACCEPTANCE TEST REPORT

for the

RADIOSONDE REPLACEMENT SYSTEM

January 2006

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service/Office of Operational Systems
Field Systems Operations Center/Test and Evaluation Branch

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Acronyms and Abbreviations

ART	Automated Radio Theodolite
AWIPS	Automated Weather Interactive Processing System
CCB	Configuration Control Board
CD	Compact Disc
CONUS	Contiguous United States
COTR	Contracting Officer's Technical Representative
CRP	NWS identifier for WFO Corpus Christi (Corpus Christi, Texas)
DCMA	Defense Contract Management Agency
EHB	Engineering Handbook
EMRS	Engineering Management Reporting System
ERH	Eastern Region Headquarters
ESA	Electronics Support Administrator
F-OAT	Follow-on Operational Acceptance Test
GPS	Global Positioning System
HMT	Hydrology-Meteorology Technician
H/W	Hardware
hPa	HectoPascal
HQ	Headquarters
INCO	Installation and check-out
LNA	Low Noise Amplifier
LWX	NWS identifier for WFO Baltimore-Washington (Sterling, Virginia)
MPX	NWS identifier for WFO Twin Cities (Chanhassen, Minnesota)
NAGS	Narrow Angle Gathering Sensor
NCDC	National Climatic Data Center
NCEP	National Centers for Environmental Prediction
NLSC	National Logistics Support Center
NWS	National Weather Service
NWSTC	NWS Training Center
NWSTG	NWS Telecommunication Gateway
OAT	Operational Acceptance Test
OPL	Observation Program Lead
OPS11	Office code for the NWS Engineering and Acquisition Branch
OPS12	Office code for the NWS Maintenance Branch
OPS22	Office code for the NWS Observing Systems Branch
OPS23	Office code for the NWS Software Branch
OPS24	Office code for the NWS Test and Evaluation Branch
OS7	Office code for the NWS Observing Services Division
OSFP	OAT Site Focal Point
OST11	Office code for the NWS Program Management Branch
PAMS	Product Availability Monitoring System

PC	Personal Computer
PDB	Precision Digital Barometer
PM	Program Manager
QAR	Quality Assurance Requirement
RDM	RRS Deployment Manager
RDT	RRS Deployment Team
RF	Radio Frequency
RRS	Radiosonde Replacement System
RSOIS	Radiosonde Surface Observation Instrumentation System
RWS	RRS Workstation Subsystem
SIR	System Issue Report
SLC	NWS identifier for WFO Salt Lake City (Salt Lake City, Utah)
SPS	Signal Processing System
ST	System Test
S/W	Software
TIN	Technical Information Notice
TRG	Test Review Group
TRS	Telemetry Receiver System
UA	Upper Air
UAPM	Upper Air Program Manager
UPS	Uninterruptible Power Supply
WAGS	Wide Angle Gathering Sensor
WFO	Weather Forecast Office
WMO	World Meteorological Organization
WSH	National Weather Service Headquarters

1.0 Introduction

The National Weather Service (NWS) will transition from the current Automated Radio Theodolite (ART) system into the new Radiosonde Replacement System (RRS) to collect and process upper air data using modern technology. The RRS will be nationally deployed after the government successfully completes an Operational Acceptance Test (OAT).

The OAT will verify the RRS is ready for national deployment and capable of supporting NWS operations without degradation of services to the public. This document describes the results of the OAT.

The OAT was conducted (in a staggered installation) between August 2 – November 4, 2005 at the following NWS Weather Forecast Offices (WFOs):

- WFO Baltimore-Washington in Sterling, Virginia (LWX; August 1 – November 4)
- WFO Twin Cities in Chanhassen, Minnesota (MPX; September 6 – November 4)
- WFO Salt Lake City in Salt Lake City, Utah (SLC; September 19 – November 4)
- WFO Corpus Christi in Corpus Christi, Texas (CRP; October 3 – November 4)

The OAT was conducted under the guidelines of the Operational Acceptance Test Plan for the Radiosonde Replacement System dated July 2005.

All problems and issues noted during the OAT were documented in System Issue Reports (SIRs) and were adjudicated by the RRS Test Review Group (TRG) (Attachment A) which met weekly every Thursday from August 18 to November 3, 2005.

2.0 Recommendations

Based on the review of the RRS OAT test results and conclusions, the RRS TRG is recommending the following items be addressed and validated by means of a Follow-on OAT (F-OAT) prior to the start of the full RRS deployment:

1. All Impact 1 and 2 SIRs are fixed. Impact 1 SIRs are defined as "Unable to successfully complete an observation - no work around"; Impact 2 is defined as "Unable to successfully complete an observation - reasonable work around." Currently there are 9 open Impact 1 SIRs and 38 Impact 2 SIRs. Of the 9 Open Impact 1 SIRs, one is scheduled for implementation in the next software build; the remaining 8 are hardware related and are being analyzed by the Engineering and Acquisition Branch (W/OPS11).

Of the 38 Impact 2 SIRs, 24 are in analysis (16 of those are dealing with radiosonde issues found at all sites; 7 deal with TRS issues); 11 SIRs are in final testing prior to build implementation.

Action: The Software Branch (W/OPS 23) and RRS Program Management to provide resources for implementation.

2. Correction and better quality control of radiosondes. Subsequent analysis of the OAT flight data by OPS11 and Observing Systems Branch (W/OPS22) personnel indicated a 3.8% failure rate of the radiosondes to acquire the Global Positioning System (GPS) signal. This exceeds the contractual specified value of no more that 3.5% radiosonde failures.

Action: OPS11/vendor (Sippican) meet the GPS quality control requirement of the manufacturing process. OPS22 complete and implement a Memorandum of Understanding to obtain on site Quality Assurance Requirement (QAR) from the Defense Contract Management Agency (DCMA).

3. Implement a RRS Help Desk. All four OAT sites requested a staffed help desk be available in the event of problems prior to or during a synoptic flight. The OPS11 temporary help was not adequate.

Action: RRS Program Manager to implement a Help Line.

4. Confirmation by the Upper Air User Community they are satisfied with the RRS data products for timeliness, reliability, and usability. Other than the reports received from the National Centers for Environmental Prediction (NCEP), there has not been any input from the Upper Air User Community concerning RRS products.

Action: The Observing Systems Branch (W/OS7) to coordinate input from the Upper Air User Community and strive for acceptance of RRS products.

3.0 Purpose

The purpose of the OAT was to provide NWS management with information verifying the RRS is ready for national deployment and capable of supporting NWS operations without degradation of services to the public. To achieve this purpose, it was necessary for the RRS to meet specific objectives (Section 4.0) under operational conditions during the OAT.

4.0 OAT Objectives and Results

The OAT findings for each OAT Objective were presented to the TRG (one at a time) with TRG members voting for each objective. All voting members (Attachment A) were instructed to vote for (1) Pass, (2) Fail, or (3) Conditional Pass. Conditional Pass meant the objective would be passed based on results from the F-OAT. Votes were taken from the voting members who were involved in each objective.

The following were the objectives of the OAT and the results of testing: (Note: Attachment B contains a summary of the OAT objectives evaluation methods.)

4.1 Objective A. The RRS is deployable, materially supportable, and operationally reliable.

OAT RESULT: This objective was met.

Note: Votes for Objective A were cast in three parts [1) Deployable, 2) Supportable, and 3) Operationally Reliable]. Comments following a vote list the reason(s) for that particular vote.

Discussion: 1) Deployable -The TRG consensus opinion is the RRS Deployment Plan and Site Implementation Plan are adequate to continue future deployments.

Attachment J contains a list of problems experienced during the RRS OAT site deployment and site installation anomalies. These issues were corrected on site and were not considered deployment issues.

Although NWS Eastern Region Headquarters (ERH) voted "Pass," they expressed a concern over the lack of a target antenna for the RRS as an aid in troubleshooting. Specifically:

> "There is a need for an external RF (Radio Frequency) emitter operating in the 1.68 Ghz band which will be used to troubleshoot and verify (RRS) system operation. Prior to system deployment, an external RF emitter, antenna, and test setup shall be developed, tested and stocked which will be used to verify WAGS/NAGS (Wide Angle Gathering Sensor/Narrow Angle Gathering Sensor) transition, verify LNA (Low Noise Amplifier) and scanner operation. This device was commonly referred to as the test target antenna in the legacy Upper Air system. Documentation [Engineering Handbook (EHB) 9-903; a new document] will be included on its use and troubleshooting of the system."

The TRG did not consider the lack of a target antenna sufficient to stop RRS deployment.

During the OAT, a weather dependent condition was observed during launches when the surface winds were calm and the balloon ascended directly over the Telemetry Receiving System (TRS) antenna. In this situation the antenna would then be forced against the "stop elevation movement" sensor. This "stop movement" results in an over-current condition identified by the code group "x800" as a status message. If five consecutive, over-current status messages are generated (within approximately two minutes) before being taken out of the "Auto Track" mode, the antenna shuts down to protect itself. At some sites, these two minutes exceed the time it takes an observer to return from launching the balloon to get to the RWS, resulting in a lost flight. This is a known problem and is under analysis. The majority of the voting members recognized the problem, but felt it was not justification to halt future deployments.

Due to the small number of OAT sites and flights flown, there has been insufficient feedback from the upper air user community to determine the quality of upper air data reported by the RRS. During the F-OAT, the upper air user community will be interrogated concerning RRS data

quality. (Note: Further information on the data integrity issue is contained in Section 4.3 Objective C.)

Eleven votes were cast for Objective A with respect to RRS as deployable.

1. Deployable:
   Pass-9;
   Conditional Pass-1 (Concern over the TRS-overhead tracking issues).
   Fail-1 (User community input needed on data integrity prior to further deployment.).

Discussion: 2) Supportable - All of the TRG, except for the NWS Training Center (NWSTC) representative, agreed the RRS was materially supportable and there were no "showstoppers" to prevent future RRS deployments after a successful F-OAT is conducted. NWSTC voted a "Conditional Pass" as they were not sure the National Logistics Support Center (NLSC) had sufficient supplies for the remaining upper air sites.

Ten votes were cast for Objective A with respect to RRS as supportable.

2. Supportable:
   Pass-9;
   Conditional Pass-1 (NLSC might not have sufficient RRS supplies).

Discussion: 3) Operationally Reliable - The RRS hardware at the four OAT sites reliably performed in excess of 1000 hours, collectively during the OAT, with only one major hardware problem (a failed/scorched integrated circuit at LWX). This problem resulted in a temporary suspension of the OAT at LWX until repairs could be made.

During the suspension LWX was required to order parts from the NLSC. When the LWX Electronics Support Administrator (ESA) tried to order the parts, he was told he was not authorized. National Weather Service Headquarters (WSH) and ERH were notified and this was corrected at WSH with WSH ordering the parts. This incident was an administrative error at WSH and has since been corrected for all of the sites.

Several OAT site personnel were concerned about the length of time the radiosonde preparation/baseline takes (upwards of 30 minutes) prior to a release as well as the time it takes (up to 15 minutes) to lock onto the GPS satellites. This issue is under analysis.

Eleven votes were cast for Objective A with respect to RRS as operationally reliable.

3. Operationally Reliable:
   Pass-8;
   Conditional Pass-2 (A better baseline process needed);

Fail-1 (User community input needed on data integrity prior to further deployment [See Discussion for 1) Deployable]).

4.2 Objective B. The RRS documentation is complete, accurate, and usable.

OAT RESULT: This objective was conditionally met.

Discussion: As part of the OAT, the Test and Evaluation Branch (W/OPS24) developed a RRS Documentation Survey for completion by site personnel prior to OAT completion. The participants were instructed to rate each RRS document they used on a scale of 1 to 10 in the areas Completeness, Usability, and Accuracy with one being the lowest and 10 being highest. Eleven OAT site staff personnel returned the survey.

Attachment C contains a summary of the survey results in tabular form. In essence, the respondents gave the RRS Site Implementation Plan an average score of 9.05 and considered it the clearest and easiest RRS document to use; the RRS Deployment Plan had an average score of 8.62; the RRS user documentation received an average score of 7.23 and was considered adequate to perform their jobs; RRS EHB 9- series received an average score of 6.68 and was thought to be adequate.

The generic documentation comments from the OAT sites were reviewed by the TRG and the average ratings for the 11 RRS documents were discussed. Based upon the RRS Documentation Survey results returned by OAT site personnel, the RRS documentation was rated (on a scale of 1 to 10, with 10 being the highest score) 7.398 for overall Completeness; 6.598 on Usability; and 6.98 for Accuracy. Attachment I contains suggestions from OAT site personnel for improving the RRS documents.

Votes were cast by the TRG members in two parts. A total of seven votes were cast by TRG members with regard to the Operator's Manual and a total of 5 votes were cast for the Maintenance Manuals:

1. Operator's Manual:
   Pass-4;
   Conditional Pass-3 (Handbook 10 should be combine with the User's Guide).

2. Maintenance Manuals:
   Pass-1;
   Conditional Pass-4 (Needs to be updated);

4.3 Objective C. The accuracy and usability of upper air products generated by the RRS are not degraded as compared to products currently generated by the ART system.

OAT RESULT: This objective was met.

Discussion: Two hundred and two (202) SIRs were written during the OAT by the four OAT sites (refer to Table 1). There were some duplicates in these numbers since the same problems were witnessed at multiple OAT sites and each site wrote independent SIRs. All software Impact 1 and 2 SIRs were resolved following the OAT and will be included in the next RWS software build designated as 1.1.3.0.

Table 1: RRS System Issue Reports Observed at OAT Sites (As Adjudicated by the TRG and CCB)

Operational Impact	KLWX	KMPX	KSLC	KCRP	WSH	Total Still Open
Impact 1 (19)	8	1	2	0	8	9
Impact 2 (49)	31	3	0	4	11	38
Impact 3 (58)	19	8	5	7	19	56
Impact 4 (50)	18	6	9	8	9	49
Impact 5 (30)	5	6	4	5	10	28
Impact 6 (39)	2	1	3	5	26	22
Totals	83	25	23	29	83	202

Prior to the OAT (i.e., since April 2004), 20 SIRs had been written requesting OS7 resolution on the issue of RRS data integrity. These included questions about an increase in the number of super adiabatic lapse rates seen over the previous, legacy system radiosonde; and an increase in the number of "wet-bulb effects" seen. Of these 20 SIRs, 14 SIRs have been closed; 1 (SIR 2619) is in a watch state; 3 SIRs (2936, 2956, 3026) were observed during the OAT and are in analysis; 2 SIRs (2842 and 2945) requested clarification on RWS User Manual procedures and resulted in the User Manual being updated.

As expected during the OAT, the NCEP Upper Air Performance Scores for the OAT sites were below the National Standard. This is attributed to the sites being "down" for almost two weeks during the RRS installation and the operator learning curve. The NCDC Upper Air Index Ranking for the four OAT sites is contained in the following table:

Table 2: NCDC Upper Air Index Ranking* for the RRS OAT Sites

Site	August 2005		September 2005		October 2005	
	Temp.	Wind	Temp.	Wind	Temp.	Wind
LWX	4.404	0.181	4.776	1.615	4.871	0.475
MPX	NA	NA	4.026	0.554	3.413	0.498
SLC	NA	NA	4.714	0.246	3.585	0.287
CRP	NA	NA	NA	NA	4.551	0.311

National Average	3.194	0.314	2.924	0.538	2.621	0.340

* The lower the score, the fewer data errors found. Zero equals a perfect score. Refer to http://www.ua.nws.noaa.gov/dataqc.htm for further information concerning the scores.

Neither NCEP nor NCDC reported any significant problems either in ingesting the RRS data or using them in the NCEP models or NCDC products. The NCEP Office of Central Operations (code W/NP1) reported the radiosondes Relative Humidity statistics for the OAT sites (Attachment D) did not show any significant problems and there were no "show-stoppers" to prohibit future deployment. This opinion is only from W/NP1 and does not reflect the opinion of other NCEP Centers.

Flight data reported by the OAT sites in the B-29 Upper Air Monthly Flight Summary (Attachment H) were analyzed and validated the operational reliability statistics presented under Objective C as follows:

95% of the flights were required to reach 400 hPa; **during the OAT, 99.4% of the flights reached 400 hPa** (496 flights out of 499);

60% of the flights were required to reach10 hPa; **during the OAT this number was 79.0%** (392 flights out of 496);

97% of the wind and temperature values were to pass the NCEP quality control checks. During October 2005 (the first month all four OAT sites were operational), NCEP rejected 146 (0.95%) wind values out of 15409 values (surface to termination) analyzed; for temperature, NCEP rejected 104 (0.47%) values out of 22151 values analyzed; and for height, NCEP rejected zero levels out of 4093. **Overall, 99.52% of RRS data passed the NCEP quality assurance checks.** These data, by site, are contained in Attachments E, F, and G. These data are summarized in Table 3.

Table 3: Summary of NCEP Quality Assurance Checks of RRS OAT Data

Category	Number of Flights Analyzed	Flights Rejected	Number of Values	Number of Values Rejected	Percent Passed NCEP QC
Winds	235	1	15409	146	99.05
Temperature	238	1	22151	104	99.53
Heights	233	0	4093	0	100

95% of the RRS products were to be transmitted within 3 hours of flight termination; during the OAT, **100% of the products were transmitted within this time frame**. According to the Product Availability Monitoring System (PAMS) results, the time a product took to reach the user community was less than 18 seconds. The average time a MicroArt product required to get to the end user was 10 seconds; the average time for RRS is 10.5 seconds. However, post-OAT analysis has indicated instances where products took as long as 12 minutes from transmission to receipt at the NCEP–yet, the same product was received within 18 seconds at other forecast offices. This is still under investigation.

Attachment H contains a summary of the RRS OAT flights. During the OAT, five second releases were required due to radiosonde failure. There were a total of 11 radiosonde failures; six lost or missed flights [reasons included failing to acquire the GPS signal (3); the balloon hitting a radio tower; the lead forecaster not authorizing a second release; and one battery failure].

Twenty-one flights out of 496 terminated for reasons other than burst. The reasons included excessive missing data (12); weak or fading signals (4); ground equipment failure (3); leaking or floating balloon (2).

Votes for Objective C were cast in two parts. Eight votes were cast.

1. Product Accuracy:
   Pass-6;
   Conditional Pass-2 (All Impact 1 and 2 SIRs observed need to be fixed)

2. Product Usability:
   Pass-5;
   Conditional Pass-3 (All Impact 1 and 2 SIRs observed need to be fixed and skew-T chart capability needs to be added to RWS)

4.4 Objective D. Using the RRS to conduct upper air operations does not adversely impact other site operations at each OAT site, and RRS product throughput does not adversely impact the performance of the Advanced Weather Interactive Processing System (AWIPS) communication network.

OAT RESULT: This objective was met.

Discussion: Only one of the OAT sites, LWX, was of the opinion RRS/RWS did affect other Hydrology- Meteorology Technician (HMT) operations at LWX by being too demanding to ensure a flight got off successfully. The other three OAT sites did not express any concern over the RWS impacting other site operations.

PAMS is a tool developed by the Office of Operational Systems to quantify the effectiveness of the AWIPS communication network in delivering weather-related products from data sources to users. PAMS analysis indicated MicroArt product times varied (depending on product size and time of transmission) from 3 to 13 seconds. As a comparison, the RRS products vary from 3 to 18 seconds for transmission from the OAT sites local AWIPS to their data users. The average MicroArt transmission time was 10 seconds; the average RRS transmission time is 10.5 seconds. The transmission impact of the increased RRS data quantity on the AWIPS network is negligible with four sites. However, cases were observed where products took as long as 12 minutes to reach the NCEP while the same products were received at other WFOs in less than 18 seconds. This is still under investigation.

Five votes were cast for Objective D.

Against RRS having any Adverse Impact:
Pass-4;
Conditional Pass-1 (More HMT resources needed)

4.5 Objective E. Evaluate any and all Work-Arounds (e.g., NSHARP). [NOTE: Objective E was not in the original RRS OAT Plan, but was added as a result of a NWSTG problem in generating RRS BUFR products.]

OAT RESULT: This objective was conditionally met.

Discussion: A problem was experienced at the AWIPS sites in which only the first 35 of 135 data levels RRS produced were being displayed on the AWIPS workstation Upper Air Sounding Skew-T application. Subsequent analysis revealed the NWS Telecommunications Gateway (NWSTG) was incorrectly coding the RRS BUFR products. This issue had been noticed with the legacy system on a much less frequent basis. As a temporary work around, LWX suggested using an application called NSHARP.

Consultation with the NWSTG indicated there would not be a fix to the BUFR problem before April, 2006, at the earliest.

LWX personnel use NSHARP on a daily basis. The other three OAT sites indicated their respective sites were able to do their jobs without NSHARP despite the missing levels.

OPS22 indicated the RRS could not be commissioned while the OAT sites were using NSHARP.

Five votes were cast for the acceptability of this work around:

Pass-2;
Conditional Pass-2 (Lack of adequate BUFR data impacts international users);
Fail-1 (Use of NSHARP is unacceptable)

5.0 Conclusions

The RRS OAT was successfully concluded on November 4, 2005. By majority vote of the TRG, all of the OAT objectives passed with the exception of Objective E, which conditionally passed. Furthermore, all agreed there were no "show-stoppers" preventing future RRS deployments—provided all Impact 1 and 2 SIRs are fixed. It was the consensus of the TRG, though, a F-OAT was still required to ensure fixes were implements prior to future deployments.

The OPS24 developed RRS Documentation Survey requested OAT site personnel describe any difficulties using RRS as well as likes and dislikes. The majority responded favorably toward RRS. Site comments are contained in Attachment K.

Table 4 contains a summary of the OAT Objective results.

(All voting members were told to vote for (1) Pass, (2) Fail, or (3) Conditional Pass. Conditional Pass means the objective will be passed based on results from a Follow-on OAT. Votes were taken from the voting members who were involved in each objective. The results are based upon the majority vote cast. If the same number of votes cast were cast for Pass and Conditional Pass, the conclusion is listed as Conditional Pass. Dissenting votes/opinions are listed in the Comments.)

Table 4: RRS OAT Objective Summary

Objective	Majority Conclusion			Comments
	Pass	Conditional Pass	Fail	
A.1 The RRS is deployable	X			One Conditional Pass (Concerned with TRS-overhead tracking) and One Failed (User community input needed prior to a deployment; more "wet-bulb effect" seen with the Sippican Global Positioning System (GPS) radiosonde than with the previous radiosonde) vote. Actions: 1) OPS11 analyze TRS concerns during the Follow-on OAT; 2) OS7 provide feedback from User Community on RRS Data during OAT; 3) The "wet-bulb effect" is under investigation

Objective	Majority Conclusion			Comments
	Pass	Conditional Pass	Fail	
				by OPS11 and may be in the next major software release in 2006.
A.2 The RRS is materially supportable	X			No comments
A.3 The RRS is operationally reliable	X			Two Conditional Pass (Better baseline process needed) and one Failed vote (User Community input needed from OS7). Actions: 1) OS7 provide User Community comments on RRS data from OAT.
B.1 The RRS Hardware documentation is complete, usable, and accurate *		X		Manuals need to be updated. Action: OPS24 solicit detailed comments from the OAT sites.
B.2 The RRS User documentation is complete, usable, and accurate *	X			Three Conditional Pass votes would like to see the Handbook 10 and the RWS User Guide combined. Action: OS7 investigate the feasibility of this suggestion.
C. 1 The accuracy of products are not degraded as compared to the ART system.	X			Two Conditional Pass votes (Fix all Impact 1and 2 SIRs). Action: Validate during the Follow-on OAT.
C.2 The usability of products are not degraded as compared to the ART system.	X			Three Conditional Pass (Fix all Impact 1 and 2 SIRs and supply skew-T capability). Action: Validate Impact 1and 2 SIRs during the Follow-on OAT. RWS software build 2 is scheduled to have a redesigned graphics package.
D. Using the RRS does not adversely impact other site operations and product throughput does not adversely impact the performance of the AWIPS communications network.	X			One Conditional Pass (More HMT resources needed) vote.

Objective	Majority Conclusion			Comments
	Pass	Conditional Pass	Fail	
E. Evaluate any and all Work-Arounds (such as NSHARP)		X		Two Pass; two Conditional Pass (display more than 35 levels; impacts international users); and one Failed (Use of NSHARP is unacceptable) vote. Action: RRS Program Management (OPS11) to work with the NWSTG to resolve their BUFR product generation problem; might be mid-2006 before resolution is obtained.

Attachment A: RRS Test Review Group (TRG) Members

Name/Email	Office Code	Upper Air (UA) or RRS Program Role	Voting Member?	Phone
Cochran, Samuel samuel.cochran@noaa.gov	OPS24	TRG Chair (for the OAT); WSH Test Team	YES	301-713-0326 x112 FAX: 301-713-0912
Lee, Jae jae.lee@noaa.gov	OPS24	WSH Test Team	NO	301-713-0326 x158
Bosco, Dominic dominic.bosco@noaa.gov	OPS11	RRS Program Manager	YES	301-713-1841 x123
Marsh, Sergio sergio.marsh@noaa.gov	ER42	Eastern Region UA Program Manager (UAPM)	YES	631-244-0169
Bonack, Bob bob.bonack@noaa.gov	CR42	Central Region UAPM	YES	816-426-3226 x424
Abernathy, Alton alton.abernathy@noaa.gov	SR42	Southern Region UAPM	YES	817-978-7777 x136
Knocke, Harold harold.knocke@noaa.gov	WR2x3	Western Region UAPM	YES	801-524-5137 x276
Hubble, Larry larry.hubble@noaa.gov	AR42	Alaska Region UAPM	YES	907-271-5135
Leeloy, Derek derek.leeloy@noaa.gov	PR12	Pacific Region UAPM	YES	808-532-6439
Ryman, William william.ryman@noaa.gov	NWS Training Center	Maintenance Training	YES	816-880-9368 x242
Ballish, Bradley bradley.ballish@noaa.gov	NP11	NCEP Data Analysis	YES	301-763-8000 x7159
Griffin, Larry Larry.J.griffin@noaa.gov	E/CC11	NCDC Archive Analysis	YES	828-271-4055
Roberts, Edward edward.roberts@noaa.gov	OPS23	RWS S/W Contracting Officer Technical Representative (COTR)	YES	301-713-0191 x154
Blackmore, William william.blackmore@noaa.gov	OPS22	UA Field Support	YES	301-713-2093 x107
Thomas, Robert robert.thomas@noaa.gov	OS7	Requirements/Operator Training & Documentation	YES	301-713-0722 x127

Name/Email	Office Code	Upper Air (UA) or RRS Program Role	Voting Member?	Phone
Modracek, Darryl darryl.modracek@noaa.gov	OPS11	RRS TRS COTR	NO	301-713-1842 x111
Navarro, Ivan ivan.navarro@noaa.gov	OPS11	Radiosonde COTR	NO	301-713-0844 x134
Monte, John john.monte@noaa.gov	OPS11	RRS Deployment Manager; RWS H/W & GPS COTR	NO	301-713-1845 x117
Paul, Jeff jeffrey.paul@noaa.gov	OPS11	RRS Deployment Team	NO	301-713-1842 x109
Darnley, John John.Darnley@noaa.gov	LWX	KLWX Observation Program Leader (OPL)	NO	703-260-0107
Schaller, Lyle Lyle.Schaller@noaa.gov	MPX	KMPX Upper Air Focal Point	NO	952-361-6670 x612
Summy, Steve steve.summy@noaa.gov	SLC	KSLC OPL	NO	801-524-5154
Maifeld, Larry Larry.Maifeld@noaa.gov	CRP	KCRP OPL	NO	361-299-1357 x249

Attachment B: Summery of RRS Objective Evaluation Methods

OAT Objective	Evaluation Methods
A. The RRS is deployable, materially supportable, and operationally reliable.	Deployable: Evaluation of approved SIRs and documentation survey results. Materially supportable: Evaluation of approved SIRs and EMRS reports. Operationally reliable: Evaluation of RRS flight data with respect to operational reliability criteria.
B. The RRS documentation is complete, accurate, and usable.	Evaluation of approved SIRs and documentation survey results.
C. The accuracy and usability of upper air products generated by the RRS are not degraded as compared to products currently generated by the ART system.	Evaluation of approved SIRs, RRS flight data and products, and input from the NWS user community. (Note: Only input received was from one of NCEP's centers and NCDC.)
D. Using the RRS to conduct upper air operations does not adversely impact other site operations at each OAT site, and RRS product throughput does not adversely impact the performance of the AWIPS communications network.	Evaluation of approved SIRs, feedback from OAT site staff, and PAMS data.
E. Evaluate any and all Work-Arounds (such as NSHARP)	Feedback from OAT site staff.

Attachment C: RRS Documentation Survey

Survey Ref #	Title	Complete	Usable	Accurate	Average Score	* Rank	Category Average
		(Based on a scale of 1-10 with 10 being highest)					
1	RRS Deployment Plan	8.43	8.43	9	8.62	2	Hardware Document Average 6.689
2	RRS Site Implementation Plan	9.14	9	9	9.05	1	
3	Engineering Handbook 1 (EHB-1): Instrumental Equipment Catalog	8	8	8	8	3	
4	EHB-4: Engineering Management Reporting System	7.5	4	4	5.17	8	
5	EHB-9: Aerological Sounding Equipment	6	3	3	4	9	
8	SIPPICAN Radiosonde/SPS Workstation S/W User's Manual	5	6.67	6.67	6.11	7	
9	SIPPICAN SPS Operations and Maintenance Manual	7	7	7	7	6	
10	RSOIS User/Maintenance Manual	7	7	7	7	6	
11	RSOIS-TM, Organizational Level Maintenance Manual	No Votes					
6	NWSO Handbook 10: Rawinsonde Observations	8	6.88	8.33	7.74	5	User Document Average 7.227
7	RWS User Guide	7.91	7.67	7.8	7.79	4	

* Ranking is based on a scale of 1-10 with 1 being the most liked and usable document; 10 being the most difficult document to use.

Suggested RRS Documentation improvements from OAT site personnel are listed in Attachment H.

Attachment D – RRS Moisture Statistics Versus the NCEP Guess (September – November 9, 2005)

Site	Num	SHB	SHR	RHB	RHR	Num	SHB	SHR	RHB	RHR	Num	SHB	SHR	RHB	RHR
	Specific Humidity is in .1 grams/Kg														
	SFC to 700 hPa					699 to 301 hPa					300 to 150 hPa				
00Z September, 2005															
LWX	561	-3.7	17.8	-2.7	17.9	656	-0.3	9.4	0.7	16.6	329	0.0	0.5	0.0	13.2
MPX	418	-6.1	15.0	-5.2	15.7	587	-2.2	7.8	-4.3	19.2	283	-0.1	0.4	-2.3	14.7
SLC	193	4.1	12.9	4.7	12.5	452	-3.1	7.7	-6.7	20.9	284	-0.1	0.3	-0.6	12.9
CRP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12Z September, 2005															
LWX	755	-2.5	19.1	-1.3	19.5	719	-2.7	11.0	-4.5	20.7	313	-0.2	0.7	-4.7	16.3
MPX	442	4.7	15.6	1.8	15.0	572	-1.6	7.9	-4.3	20.0	318	-0.1	0.5	-1.6	17.3
SLC	243	10.9	18.2	7.7	16.8	399	-0.1	5.6	-0.8	17.1	237	0.1	0.3	3.8	12.4
CRP	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
00Z October, 2005															
LWX	648	-4.4	14.8	-4.5	17.3	788	-1.1	7.3	-2.4	18.6	344	-0.1	0.7	-0.4	15.7
MPX	589	-5.7	13.4	-7.6	18.3	674	-2.2	5.7	-6.6	17.0	435	0.0	0.3	-1.3	16.5
SLC	273	0.1	10.4	-0.1	14.5	662	-2.1	6.7	-5.0	18.1	414	-0.1	0.3	-1.2	14.8
CRP	635	-0.2	15.2	-1.3	13.4	986	-3.7	11.2	-5.0	22.0	263	-0.1	0.8	-2.2	15.3
12Z October, 2005															
LWX	711	-2.9	14.3	-2.6	16.6	703	-1.2	8.2	0.1	16.9	380	-0.1	0.3	-0.3	12.9
MPX	622	0.8	8.3	0.1	13.9	620	-1.1	6.0	-3.5	16.3	442	0.0	0.3	-0.1	15.9
SLC	369	3.2	8.9	0.8	11.9	663	0.0	4.9	0.8	17.6	410	0.0	0.3	3.8	17.3
CRP	755	6.7	19.8	5.0	16.7	1011	-1.8	10.2	-2.1	18.5	293	-0.1	0.5	-2.8	12.6
00Z November 1 – 8, 2005															
LWX	150	-12.3	16.2	-15.1	21.1	171	-1.9	6.5	-4.7	18.7	99	-0.1	0.2	-2.0	12.8
MPX	124	-3.1	7.7	-6.0	15.3	123	0.3	3.1	4.2	18.5	94	0.1	0.2	6.4	15.6
SLC	63	-7.1	9.3	-10.8	13.8	185	-2.7	4.5	-11.4	20.4	97	-0.1	0.2	0.5	16.3
CRP	170	-4.5	17.4	-6.0	17.4	151	-4.6	10.2	-8.0	16.8	94	-0.2	0.4	-3.6	16.6
12Z November 1 – 8, 2005															
LWX	171	-1.8	8.7	-0.9	15.3	143	0.5	3.2	2.3	10.9	105	-0.1	0.2	0.0	13.4
MPX	172	-0.5	6.8	-1.8	15.1	160	0.2	3.4	3.1	20.3	117	0.0	0.2	4.2	14.0
SLC	70	-3.8	8.6	-12.0	19.8	155	-0.2	3.2	2.2	16.2	113	0.0	0.2	2.0	15.5
CRP	204	3.5	19.1	1.6	19.1	113	-2.6	9.8	-1.8	16.4	88	-0.1	0.3	-4.2	10.5

Num is the number of observation in the pressure category
SHB is the Specific Humidity Bias versus the guess
SHR is the Specific Humidity RMS difference to the guess
RHB is the Relative Humidity Bias versus the guess
RHR is the Relative Humidity RMS difference to the guess

Attachment E – NCEP Upper Air Temperature Inventory for October 2005

Site	Flights	>10% Rejections	Any Rejections per Pressure Category						Termination Levels						
			SFC – 400 hPa		399-100 hPa		99 – 0 hPa		A	B	C	D	E	F	G
			NT	Rej.	NT	Rej.	NT	Rej							
LWX	62	0	2610	37	1487	0	1382	0	61	60	60	58	53	33	0
MPX	59	0	2293	2	1641	0	1464	0	61	60	60	60	55	44	0
SLC	61	0	1793	6	1592	0	1841	0	61	61	61	59	56	51	3
CRP	56	1	2884	59	1278	0	1886	0	56	56	56	55	55	52	11

>10% - Flights with more than 10% rejections

NT – Number of temperature levels per pressure category

Rej. – Number of temperature rejections per pressure category

Termination Levels:

A = at or above 400 hPa
B = at or above 200 hPa
C = at or above 100 hPa
D = at or above 50 hPa
E = at or above 20 hPa
F = at or above 10 hPa
G = at or above 5 hPa

Attachment F – Upper Air Wind Inventory
for October 2005
RRS OAT Sites

Site	Flights	>10% Rejections	Any Rejections per Pressure Category						Termination Levels						
			SFC – 400 hPa		399-100 hPa		99 – 0 hPa		A	B	C	D	E	F	G
			NT	Rej.	NT	Rej.	NT	Rej							
LWX	59	1	1414	1	980	7	1447	44	61	59	59	56	52	30	0
MPX	59	0	1223	2	1038	6	1549	23	60	59	59	59	54	40	0
SLC	61	0	996	1	1098	12	1866	16	61	61	61	59	56	51	2
CRP	56	0	1293	0	800	1	1705	33	56	56	56	55	55	52	9

>10% - Flights with more than 10% rejections

NT – Number of wind levels per pressure category

Rej. – Number of wind rejections per pressure category

Termination Levels:

A = at or above 400 hPa
B = at or above 200 hPa
C = at or above 100 hPa
D = at or above 50 hPa
E = at or above 20 hPa
F = at or above 10 hPa
G = at or above 5 hPa

Attachment G - Upper Air Height Inventory
for October 2005
RRS OAT Sites

Site	Flights	>10% Rejections	Any Rejections per Pressure Category						Termination Levels						
			SFC – 400 hPa		399-100 hPa		99 – 0 hPa		A	B	C	D	E	F	G
			NT	Rej.	NT	Rej.	NT	Rej							
LWX	57	0	432	0	301	0	279	0	61	60	60	58	52	28	0
MPX	59	0	427	0	303	0	301	0	61	60	60	60	55	38	0
SLC	61	0	346	0	311	0	363	0	61	61	61	59	56	49	2
CRP	56	0	396	0	280	0	354	0	56	56	56	55	55	51	5

>10% - Flights with more than 10% rejections

NT – Number of height levels per pressure category

Rej. – Number of height rejections per pressure category

Termination Levels:

A = at or above 400 hPa
B = at or above 200 hPa
C = at or above 100 hPa
D = at or above 50 hPa
E = at or above 20 hPa
F = at or above 10 hPa
G = at or above 5 hPa

Attachment H - Summary of RRS OAT Flights
(Taken from the B-29 Reports for August 9 - November 4, 2005)

Flight Data	KLWX (8/1-11/4/05)	KMPX (9/6-11/4/05)	KSLC (9/19-11/4/05)	KCRP (10/3-11/4/05)
Total OAT Flights (499)	197	123	99	80
Synoptic (460)	189	116	91	64
Special (39)	8	7	8	16
Second Release (5)	2	3	0	0
Third Release	0	0	0	0
Reaches 400 hPa* (496)	194 (98.5%)	123 (100%)	99 (100%)	80 (100%)
Reaches 10 hPa** (392)	134 (69.1%)	94 (76.4%)	90 (90.9%)	74 (92.5%)
Highest Termination	34565m	33689 m	35802 m	35656 m
Lowest Successful Termination	6130 m	8353 m	13245 m	19947 m
Flight Termination Reasons Other than Burst				
Lost/Missed Flights (6)	3	3	0	0
Excessive Missing Data (12)	5	5	2	0
Weak or Fading Signal (4)	0	0	4	0
Radiosonde Failure or Rejection (11)***	6	3	2	0
Leaking or Floating Balloon (2)	0	1	1	0
Battery Failure (1)	0	0	1	0
Ground Equipment Failure (3)	3	0	0	0

* Reached 7000 meters
** Reached 30,000 meters
*** Some radiosondes were returned to WSH because of packaging issues – total number not known.

Attachment I - Suggested RRS Documentation Improvements from RRS OAT Site Staff

(Note: The reference number is the number assigned to the document in the RRS Documentation Survey developed by OPS24. Only those for which improvements were provided are included in this list)

Ref #1: **RRS Deployment Plan**

"The Deployment Plan was too brief. Although in hindsight, it basically covered the salient points, a list of milestones should have been included."

"Consolidate and Highlight "Checklists" and "Must have/do" items into a separate section and reference these items in the other documentation. Improve GPS repeater installation guidelines and clarify technical issues with respect to "repeater line of sight to horizon", roof pitch, inside mounting distance, structural interference, signal degradation and causes."

Ref #2: **RRS Site Implementation Plan**

"RRS Site Preparation Checklist was great. We used it as a training guideline. If an observer covers the elements listed on the checklist, he/she should have no problem with the certification process."

"Ensure all work permits, property accounting (decommissioning/commissioning), equipment disposal, LRU returns, Station Data and Configuration data items are all pre-filled as much as possible and copies of this paper work are given to site."

Ref #4: **EHB-4: Engineering Management Reporting System (EMRS)**

"Ensure [the manual] has new property assets, including serial numbers of new equipment, are entered and assigned to the office. Ensure NLSC database has the site on their list of authorized personnel to order spares."

Ref #5: **EHB-9: Aerological Sounding Equipment**

"EHB9 is still in draft form and needs to be finalized by the time 25% of the sites are fielded. I would suggest consolidating the separate EHB-9 manuals dealing with subsystems of the RRS into one cohesive EHB9 that incorporates all subsystems."

Ref #6: **NWSO Handbook 10: Rawinsonde Observations**

"Suggest creating sub chapters in WSOH#10 for RRS…rather than combining both Micro Art and RRS instructions in the same chapter, it's confusing."

"I agree with the suggestion of separating the RRS and MicroArt information into two separate chapters or sub-chapters. It would make navigating the material considerably easier. In addition, there was some duplication of material between OH10 and the User Guide, particularly in the R-CDU operation descriptions. Perhaps these could be consolidated to eliminate duplication/redundancy."

"Handbook 10 is quite informative, but can sometimes be difficult to read."

Ref #7: **RWS User Guide**

"RRS Users Guide adequately covered operations. I found Appendix E very useful. It covered about 99% of the kinds of problems that I encountered."

"Appendix E in the RWS user guide needs some work. Portions could stand to be expanded or rewritten as the steps are often hard to follow. Section 12 (Transferring Archive Files) needs to be changed to reflect what we actually do (that is, remove mention of WinZip). A more detailed section 13 (Special In-flight Situations) would likely be beneficial as well, so the user is less likely to keep bad data in."

New Document Request:

"I would like to have a reference manual with (procedures and illustrations 101) for the office. A very basic, simple, A to Z instructional tour. Instructions that management, forecasters, or HMT's are not working on a regular basis; would be able to use and understand, and be confident enough to get a balloon in the air--sans the technical data."

"Instead of having all these different handbooks, just make one handbook with all the information needed for doing successful flights in the chronological order of doing an upper-air flight. For instance, when it comes to prep the instrument, have the instructions to do so properly included in the one handbook so that the flyer doesn't have to go to another manual to remember how to prep the instrument properly."

Attachment J - RRS OAT Site Installation Anomalies and Problems During OAT

Even though OPS11 had developed detailed deployment and installation plans, each RRS OAT site presented unexpected installation issues which were overcome by the RRS Installation Team. This section documents the "anomalies" at each site. These anomalies are taken from the respective site's Acceptance Test Procedure (ATP) Report compiled by OPS22 personnel prior to the commencement of the OAT.

1.0 Baltimore, MD/Washington, DC WFO (KLWX) [August 8-9, 2005]

"During installation of the RWS at the Sterling forecast office, it was determined that a systemic failure existed in the RWS such that the modem hardware was unable to function properly when communicating with the various LDAD systems used for backup dial-out transmission of upper air products.

"It was determined by the RRS Deployment Team and the RRS Program Office that the problem was caused by an incompatibility between the RWS modem and/or modem configuration and certain LDAD installations. Although this configuration did not exhibit problems when tested at other non-forecast office locations, it did occur in the KLWX forecast office environment. To address this issue, a temporary replacement modem was located and installed so that RRS installation and acceptance activities could continue at the Sterling forecast office.

"The Sterling forecast office and the Eastern Region Headquarters hereby authorize the use of this temporary modem hardware as an interim configuration; and agree to accept the RRS for operational use and to allow the RRS Operational Acceptance Test (OAT) to begin using the configuration. This configuration will be used until such time as the RRS Program Office is prepared to issue a formal solution."

As of the date of this report, KLWX is still using the temporary modem hardware. However, a modem configuration application has been provided to the other OAT sites to enable them to use the original modem.

The following hardware SIRs were submitted during the RRS installation and checkout using the RRS Acceptance Test Procedure (ATP): [Note: The ATP is not a part of the OAT.]

"SIR # 2849 - During the Initialization ATP for Sterling WFO deployment, step 76 failed. "Verify that communications with launch area via intercom are established." The expected result was "Communication via the intercom is established." The communication via the intercom would only work for a second and the cut off. [This has since been corrected by adjusting the intercom's configuration.]

"SIR # 2852 - During the WFO Operational flights out of building 16, Radiosonde SN 85001694 / 3032982 was rejected for a pressure discrepancy of > 5 hPa after being retested two times.

"SIR # 2853 - During the WFO Operational flights out of building 16, Radiosonde SN 85002016 / 3032509 was rejected for a pressure discrepancy of > 5 hPa after being retested two times."

During the OAT, KLWX experienced a hardware failure and fire at the LWX radome that caused the loss of two synoptic flights and the temporary suspension of the OAT at the site. An over current condition caused by overhead flights caused a chip to fail on the Motion Control Card (MCC) of the Motion Control Unit (MCU) which in turn caused the Signal Communication Assembly (SCA) to overheat and burn the circuit board. The LWX Electronics staff performed troubleshooting, analysis, and repair of the RRS in a timely manner. However, when they tried to order the parts for the RRS system they could not due to permissions at NLSC. This has subsequently been corrected.

2.0 Chanhassen, MN WFO (KMPX) [September 3-4, 2005]

"1. DCE to RWS Cable Length. SIR#: (2900) – Due to a nonstandard installation of the DCE the site is using a 35 foot RS-232 cable. An additional 10 foot RS-232 serial cable was added to the standard 25 foot cable to meet required length.

"2. RWS AC Rack Distribution. SIR#: (2901) – DCE remotely located so the AC power strip is only providing power to the DCE.

"3. GPS Repeater Installation. SIR#: (2902) – GPS repeater was installed in nonstandard configuration that leaves the power in a continuous on state. GPS repeater installation modification note needs to be reviewed so to provide a more detailed installation expectations for the sites.

"4. Site Power. SIR#: (2904) – Power supplying the Upper Air inflation building showed an unbalanced voltage between the neutral and the ground. Site corrected the problem.

"5. SCA Failure. SIR#: (2905) – Upon the start-up of the TRS the SCA would not initialize. A new part was ordered by InterMet to correct the problem. After installing the SCA the problem was corrected."

3.0 Salt Lake City, UT WFO (KSLC) [September 16-17, 2005]

An anomaly from the other OAR sites is KSLC is using a Balloon Inflation and Launch Shelter (BILS) rather than a high-bay inflation shelter.

Figure 1 - KSLC BILS

“SIR # 2938 Deviation: KSLC RRS Deployment - Grounding plate not installed on GPS repeater installation. Action: Grounding plate installed per MOD note. WFO has modified the installation to conform to the MOD note.

“SIR # 2939 Deviation: KSLC RRS Deployment - Release Point CDU and cable mounting is not standard. Action: Release point CDU mounting and cable run is meant to be a temporary setup, but will suffice for OAT. Design for permanent installation is being coordinated with NWS headquarters and InterMet.

Figure 2 - KSLC CDU and Intercom Deviation

“SIR # 2940 Deviation: KSLC RRS Deployment - The radome is not on the lightning grid. Action: The radome is considered protected by the WFO's zone of protection.

“SIR # 2941 KSLC RRS Deployment - The release point intercom functions intermittently. Action: A replacement release point intercom was ordered. After installing and reprogramming the new intercom, the intercom problem appeared to be corrected. Then during the first OAT flight, it started acting up again. InterMet experimented with the intercom system and it now appears the original problem may have been related to the temporary installation which is in a small trailer. It is suspected that the trailer may be

creating echoes or reflections which are causing the system to malfunction. The Intercom box has been temporarily moved to the outside of the trailer. Although it appears to be working correctly, recommend leaving this SIR open until permanent installation is completed.

"SIRs 2942, 2949, & 2950 (SIRs listed below)

"There have been three SIRs written about different problems all related to the azimuth drive (SIRs listed below). These problems may have been symptomatic of one problem. During flight 1515, the problems identified in SIR # 2950 were documented. Then when preparing for flight 1516, the items documented in SIR # 2949 occurred. These problems were also symptomatic of what prompted InterMet to look for the problem which resulted in SIR 2942. To correct the problems addressed in SIR 2949, the Azimuth motor was replaced from the parts which were ordered when the problems first began with SIR 2942. So the bad connector identified in SIR 2942 may not have been the source of the real problem. In general, the system seems to be working better with the new motor. Although the problem has not reoccurred, recommend leaving all three SIRs in an analysis state because there may be a related problem when tracking at high elevation angles.

"SIR # 2942 (Addressed Above) KSLC RRS Deployment - Azimuth motor cable had bad connector pins. Action: The azimuth motor cable connector was repaired.

"SIR # 2949 (Addressed Above) KSLC RRS Deployment – KSLC was preparing a special release as part of training. TRS AZ motor lost control and started spinning out of control. Action: InterMet replaced azimuth motor. The problem appears to be corrected. Same problem was documented in SIR # 2942 and was thought to have been corrected.

"SIR # 2950 (Addressed Above) KSLC RRS Deployment – Azimuth motor became limp when trying to transition from WAGS to NAGS at a high elevation angle. RWS showed 5 azimuth motor over-current messages (0x0800) in the status messages. The observer quickly reset the TRS in the Hardware Status display and retuned the TRS frequency to the radiosonde (1676 MHz). The observer pointed the antenna in the general direction of the radiosonde and clicked the Search button in the TRS Display. The TRS locked on to the radiosonde with just over one minute of missing data. This possibly related to SIRs 2942 and 2949.

"SIR # 2943 KSLC RRS Deployment ATP SIR:
During the Initialization ATP, RWS showed an out of range error, "Elevation of -10.040000 is out of the range of -10.0 to 91.5". This appeared when the TRS was command to move to 360 azimuth from the TRS Display. The Desired Elevation was left empty.

"Per Kevin Kay (OPS23) subsequent analysis: As a result of Slew Down commands, the logged elevation is 349995 aka -10.04. So a subsequent Move with a blank elevation field will apparently attempt to use the as-read value from the TRS, as if it were a user input, and

fail the user-input range check.

"SIR # 2944 KSLC RRS Deployment ATP SIR:
CDU displayed different azimuth than displayed on the RWS TRS display. The discrepancy was consistently 0.01 degrees. Suspect that the CDU is truncating the third decimal digit of the azimuth angle and RWS is rounding the azimuth angle."

4.0 Corpus Christi, TX WFO (KCRP) [September 30 - October 2, 2005]

SIR# 2987--Re-radiation amplifier on/off switch not easily accessible, due to being located above the ceiling grid. Amplifier must be left on at all times.

SIR# 2988 - Communication with remote intercom intermittent. Due to high ambient noise levels, the intercom became intermittent. InterMet corrected the discrepancy by adjusting the microphone sensitivity level. The problem was resolved.

SIR# 2992 - During conditions where limited search mode was initiated by RWS, the user could not put the TRS back into manual. The operator had to use the Remote CDU to stop the search routine to put the TRS in a Manual tracking state.

SIR# 2993 - Sippican Mark II A sondes had a considerable amount of indentation creases on the outer case of the sonde. Most damage was noted near the area of the duct.

SIR# 3019 - The fiber optic junction box that houses the fiber optic bulkhead connector hub not installed. The fiber optic bulkhead connector hub was installed into a pre-existing junction box.

Attachment K - Site Personnel RRS Likes and Dislikes

RRS Likes:

"The ability to launch and lock on the balloon easier."

"The system is much more user friendly."

"We have a much larger data set."

"We can use the data almost real time."

"No more optical comparatives."

RRS Dislikes

"Large number of radiosondes display problems with pressure and/or signal strength."

"You don't have time to reacquire the sonde when TRS locks up if you don't immediately reset TRS. The observer may be busy with other tasks to notice the problem right away."

"Up/Down slider of the GUI is a pain to use. Grabbing the bar and moving it more than a few centimeters at a pass is impossible."

"Radiosonde serial numbers are not retrievable after balloon release."

RRS Documentation Question 2. Do you have any problems using RRS/RWS:

"None other than the learning curve associated with any new system."

"None. This system is quite an improvement from the past operation."

"Only when SPS does not initialize, or when you have to reject an instrument. Seems like it is too easy to get behind the eight ball with these occurrences."

"I have no problems using the system at this time."

"None…in fact we were just talking this evening, that RRS is operating with fewer problems than were common with Micro Art. Can't remember the last time we went nearly 2 months using Micro Arts when we did not have at least a half dozen problems…with RRS we have had 2 non-system related problems."

"No. The process is pretty straightforward and the software seems to be (mostly) sound. The only significant problem I've encountered is the occasional SPS initialization failure, which can usually be fixed relatively easily."

"The only issue I have is the baselining process. The 8+ minute wait after connecting the battery seems a little too long for me. Assuming everything works correctly, the timeline provided works fine. However, I had a scenario when the GPS in the instrument malfunctioned. It took me about 15+ minutes to get the next instrument prepped and ready to go (after activating the battery, baselining, etc.). The old ART system did not take as long to prep/baseline an instrument."

"Actually, in my experience there is nothing negative about RRS. It is great, convenient, and easy to handle once you get used to the software. After a month, I feel comfortable with both the software and the new radiosondes, and am able to work around most any problem I come across."

OAT Site Recommendations:

"Some kind of safety factor to prevent early releases, a tool to prevent baselining before the sonde is ready. Give us a method to archive and FTP at the same time and to upload data to MIRS."

"Including the ability to display the data as they are received on a Skew-T/Log-P diagram rather than just a linear height or time diagram."

"Including the ability to automatically upload pertinent indices into the WSR-88D ORPG in order to update the information input into severe weather algorithms with little user intervention. Several SIRS and some discussion have occurred on this point."

"Several…provide data for support of WSR 88D on flight summary; add radiosonde number not id to flight summary; allow for easier changing of transmission destination than is now allowed…perhaps a drop down menu from the tools menu."

"I would add the ability to display a skew-T plot of the data in the software (as opposed to having to wait until it gets into AWIPS to see what it looks like)."