P1.3 DEVELOPING A MODEL FOR TRANSITIONING RADIOSONDES IN THE NWS UPPER AIR NETWORK

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1. INTRODUCTION

The National Weather Service (NWS) is developing the Radiosonde Replacement System (RRS) to replace its antiquated Microcomputer Automatic Radio-Theodolite (Micro-ART) system, which has been in operation since the late 1980s. The RRS comprises a new Global Positioning System (GPS) tracking antenna called the Telemetry Receiver System or TRS; 1680 MHz GPS radiosondes and a Signal Processing System (SPS); and a new NT-based workstation. In addition to the deployment of the RRS, a new surface weather observing system called the Radiosonde Surface Observing Instrumentation System (RSOIS) and precision digital barometers will be deployed at most of the 102 observation sites located from the Caribbean to Guam and from Alaska to Pago Pago, American Samoa in the Southern Hemisphere.

As deployment of the new RRS begins in 2003, sites using the current variety of RDF (radio-direction finding) and LORAN-C (long-range aid to navigation) radiosondes will be systematically transitioned to the new GPS radiosonde design. During this transition period, NWS must carefully manage the phaseout of the current radiosondes to preclude over-ordering. This extended abstract presents a radiosonde transition model for forecasting radiosonde use and for optimizing use of current radiosondes in the NWS upper air network while transitioning to the new design.

2. CURRENT NWS NETWORK

Figure 1 identifies the types of radiosondes currently flown in the NWS network, including the Sippican B2/Mark II variety (V49LG, V49L, V51) and the Vaisala RS 80-57H (VSL52), and their locations. These radiosondes will be phased out of the NWS upper air network with the introduction of the new GPS radiosondes. Two vendors, Sippican and InterMet Systems, have developed radiosondes of the new GPS design. Figure 2 shows the NWS Pacific Region upper air network sites where the new radiosondes will be deployed.

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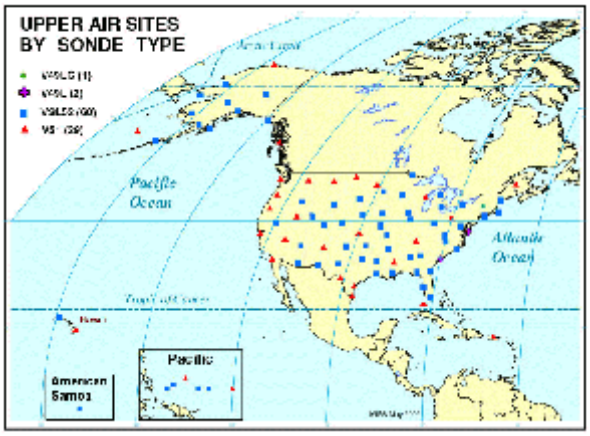

Figure 1. Types of Radiosondes Used at NWS Locations.

3. TRANSITION MODEL

The radiosonde transition model developed by NWS is predicated on several factors, including:

- The monthly use rate for each type of radiosonde based on the number of flights per day
- The RRS deployment schedule for each site and the designated radiosonde vendor
- The prioritization of sites for deployment based on special activities such the Operational Acceptance Test (OAT).

Certain assumptions are required to execute the model, and these assumptions are variables that can change as new information becomes available. Current assumptions for the transition model are as follows:

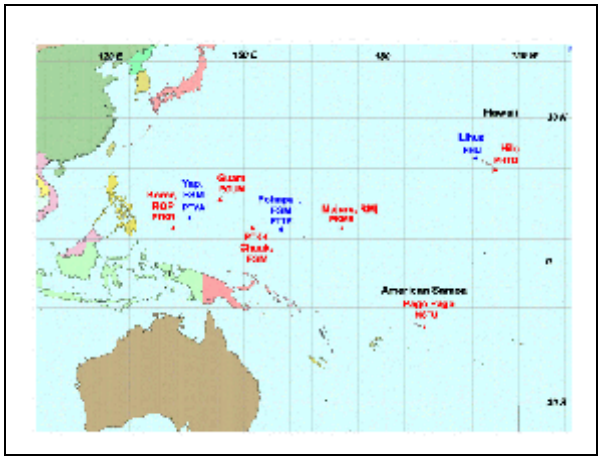

Figure 2. Pacific Upper Air Locations. *(Sites in red are GCOS.)*

1. The use rate of the new GPS radiosondes will approximate the RDF/LORAN radiosonde rate. This means the number of soundings and the average second/third radiosonde releases are about the same.

2. The GPS radiosonde vendors will follow a 60/40 percent split of the radiosonde network, meaning that vendor 1 will supply approximately 60 percent of the radiosondes required each month to operate the NWS upper air network and vendor 2 will provide approximately 40 pecent. *Note:* At the time this extended abstract was prepared (October 2002), NWS had not decided which radiosonde manufacturer (Sippican or InterMet) would be vendor 1 and which would be vendor 2. Knowing which vendor has what proportion of the network is not critical, however, in understanding the model.

3. It is estimated that the RRS will be deployed at approximately two sites per month. At this rate, it is expected that all NWS sites will complete the transition to the RRS by the end of fiscal year (FY) 2006 or the beginning of FY 2007. However, this schedule could change depending on the actual rate of deployment.

Each of these factors are entered into the model and validated for consistency.

4. RESULTS

Figure 3 depicts the outcome of the transition model, given current assumptions, in forecasting the phaseout of each type of radiosonde in use today in the NWS upper air network as the new GPS radiosondes are introduced.

As shown in Figure 3, use of the B2 variety of radiosonde will increase during 2003 due to the replacement of the Carribean Hurricane Upper Air Stations (CHUAS) beginning in late calendar year (CY) 2002 and continuing through early CY 2003. However, with the deployment of RRS beginning in 2003, the use rate will progressively diminish and then stabilize in 2006 when NWS purchases only enough RDF radiosondes for the CHUAS network.

The Vaisala RS80-57H model is expected to be phased out by 2006 or 2007. Thus, the rate of use within the network is near linear or possibly a cubic spline function.

LORAN-C radiosondes will be phased out by the end of 2004, except at Wallops Island, Virginia, where this type of radiosonde will continue to be used until a decision is made regarding a replacement system.

In 2003, the monthly use rate of GPS radiosondes in the upper air network will be low for both vendors, but use rates will gradually increase to the maximum by 2006. The transition to the GPS radiosondes will have to be carefully managed to ensure continuity of operations during this period.

5. CONCLUSION

The NWS's transition to new GPS radiosondes will necessitate a carefully planned approach to ensure a cost-effective and seamless process. The radiosonde transition model allows NWS to project radiosonde use rates throughout the transition period. These use rate projections are critical for making budget estimates and for ensuring that an adequate number of the current radiosonde types are ordered to meet operational needs.

6. REFERENCES

AMS Paper 8.6, Update on the Implementation of the National Weather Service's Radiosonde Replacement System.

7. ACKNOWLEDGMENTS

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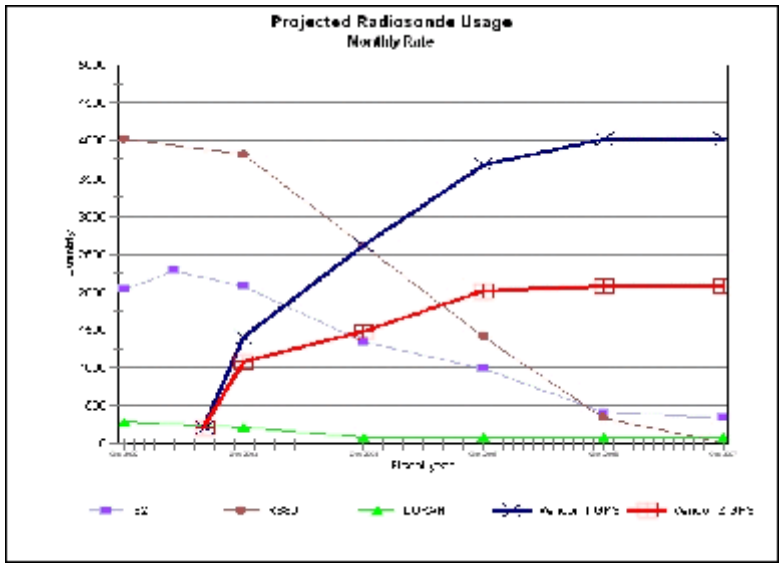

Figure 3. Radiosonde Transition Model.