AWS Additions and Modifications to Support Wind Alert Forecasting Application for McMurdo, Antarctica

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ABSTRACT

Wind Alert is a program tool for forecasting high winds in the McMurdo region. It was adopted from the base elements outlined in R.E. Holmes et al., Utilization of Automatic Weather Station Data for Forecasting High Wind Speeds at Pegasus Runway, Antarctica. These elements have proven reliable over the years in the prediction of extreme wind events causing hindrance to flight operations. It is in the best interest of USAP operations to continue this application. A proposal to increase availability of data and reliability through placement of operational equipment and justification of the operational requirements is contained in this request.

Overview:

The current forecasting technique "Wind Alert" program is based on a notification scheme identified by Dr. Robert Holmes *et al.* in his Ross island area wind study. As per the Holmes study, the data for Wind Alert is obtained from the science oriented project of Antarctic Meteorology Research Center (AMRC), Space and Science Engineering Center (SSEC), at the University of Wisconsin. AMRC stages, maintains, and provides Automated Weather Station (AWS) systems for the United States Antarctic Program (USAP). The objective of AMRC's program is to collect and provide weather data for science research around the Antarctic continent.

The Wind Alert program obtains its data from this science project in a paid for service cooperative with AMRC for a near real-time feed of all the projects AWS systems. This data is provided via a single weather satellite (NOAA18) in a polar low earth orbit (LEO). Based on this single satellite collection and distribution, the periodicity is separated by the 101 minutes from one pass until the next return on its orbit. In addition there are gaps in this coverage through the day when the orbits take it too far east or west of the ground station and are deemed over the horizon. This limits the use of the Wind Alert tool in periodicity and the time of day programmed gap.

AMRC's AWS program maintenance is limited to annual visits, decreasing the reliability of the data feed. Systems have been known to have long term outage with replacement/repair only occurring well into an operational season when the AMRC group is present.

Due to the success of this analyzing forecasting tool, many high wind events have been forecasted in advance, saving flights in countless of occurrences from hazardous conditions. This can be improved through increased reporting and reliability. Because of the operational utility of the

Wind Alert program it should be constructed as an operationally required system.

Request:

It is requested that operational equipment with greater reporting and maintaining capabilities be provided to this important forecasting tool. This will increase the reliability and availability of data and improve the accuracy of hazardous weather forecasting for flight operations.
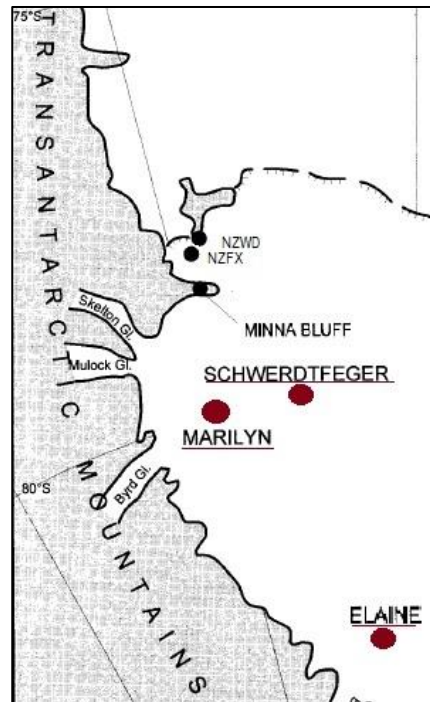
Requirements:

Request reporting increased to a minimum of every hour, 24 hours per day. Although an increase in reporting could be leveraged, this item is power dependent. Assured hourly reporting is more beneficial to the program over a system that is stretched and prone to data outages due to weak or spent batteries.

Data season should be provided no later than 15 October through 28 February. The system should be capable of waking by the start of a new season. At the end of FAA flight checks the airfields are capable of receiving aircraft at lower weather minimum limits. This increases the reliance on accurate forecasting services and would drive the need for mid-October as a starting date. Required data from the following locations would include:

- A reporting barometer at or near AMRC AWS Elaine, 83.15S, 174.46E
- A reporting wind direction, and barometer at or near AMRC AWS Marilyn, 79.98S, 165.03E
- A reporting wind direction, and barometer at or near AMRC AWS Schwerdtfeger, 79.94S, 169.83E

Note: Although other data could be obtained it is believed that keeping it to only the

required data in the simplest form will increase the power capability and improve reliability of the system.

Recommendation:

Reuse of existing equipment or new procurement of required material could fast track the implementation, if approved. Recommended items include:

- Campbell Scientific dataloggers – We currently have 4 of these in stock and they can provide the needed low power collection and reporting capabilities
- Iridium Short Burst Modems for transmission of observations
- Barometers can provide pressure readings required at all three locations
- RM Young anemometers for Marilyn and Scherdtfeger locations can be reused for wind direction. A wind vane alone would suffice for simplicity but the RM Young may be an easier

solution for economy and consistency of integration.

Remaining items of instrument enclosure, power system, GPS locator, sensor mounts, and towers would be required to complete the systems.

If possible any installations on the AMRC existing tower(s) could shorten and simplify the installation process.

Summary:

Current reporting AWS systems are slow in reporting and have daily programmed outages. The AMRC AWS s are fully equipped with a host of sensors and infrequent maintenance/repair capabilities. Operationally supported systems in a more streamline design will improve reporting periodicity and reliability increasing the functionality of this vital tool.

REFERENCE

R. E. HOLMES, C. R. STEARNS, G. A. WEIDNER, AND L. M. KELLER, 1998: Utilization of Automatic Weather Station Data for Forecasting High Wind Speeds at Pegasus Runway, Antarctica, W E A T H E R A N D F O R E C A S T I N G, Vol 15. Antarct. J. U.S , 137-151