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The 2002 Salt Lake City Winter Olympic and Paralympic Games are now a fond memory of athletic achievement and enjoyable spectator experience. A key aspect of the overall success was the extensive planning and effective implementation of a variety of support activities, including aviation security operations. The USAF Tactical Meteorological Observing System (TMOS), supplied by Vaisala, provided sports venue real-time meteorological data and played an important role for the USAF to effectively carry out their aviation support activities.

Support for medical and security aviation operations **US Air Force TMOS (TACMET) at 2002 Winter Olympics in Salt Lake City**



PHOTO COURTESY BY UTAH TRAVEL COUNCIL

The Salt Lake City Olympic Scene

The recent 2002 Winter Olympics Games and the subsequent Paralympic Games in Salt Lake City, Utah, during February and March are now a pleasant memory. The Salt Lake Olympic Organizing Committee (SLOC) earned high praise in doing a great job in orchestrating all of the support activities for a record number of events during the Games.

The sprawl of Olympic activities was large. In addition to Salt Lake City (SLC) being the site for the Opening and Closing ceremonies, as well as Medal Award ceremonies, there were seven sports venues scattered north and south along the nearby Wasach Mountain Range:

- Ogden/Snowbasin Area – Curling and Alpine Downhill (51 miles north of downtown SLC)

- Utah Olympic Park – Bobsleigh, Luge, Ski Jumping, Nordic Combined (32 miles east from downtown SLC)
- Park City/Deer Valley – Alpine Giant Slalom, Snowboard, Freestyle (8 miles further from Olympic Park)
- Heber City/Soldier Hollow – Biathlon, Cross-Country Skiing, Nordic Combined (15 miles further from Park City)
- Provo – Ice Hockey (46 miles south of downtown SLC)
- West Valley/Kearns – Ice Hockey, Speed Skating
- Salt Lake City – Figure Skating, Short-Track Speedskating

The Weather Monitoring Challenge

Weather information was essential for the planning and maintaining of activities at the Olympic Games in SLC and surrounding areas. The venues of the Games spanned a large area in northern Utah, where the ter-



TMOS being installed at Mountain Airport. Note mobile ATC Tower on Humvee in the background. TMOS hard-wired to PC in ATC Tower for airport operations. Temperature at the time is -4 °F (-20 °C).



TMOS at Utah Winter Olympic Park site. TMOS team members providing checkout during a routine site visit.

rain is complex. Not only outdoor sport events but also many other activities were affected by the weather, such as outdoor ceremonies, transportation, parking, snow making, emergency and security operations. In addition to being prepared for adverse, even hazardous weather, the organizers and athletes participating in outdoor events continuously required accurate and timely weather information. To provide this information, an extensive weather support system was developed, which was managed by the Salt Lake City Olympic Organizing Committee (SLOC). It involved meteorologists from government agencies, private companies and the University of Utah.¹

Because of the complex terrain of Northern Utah and the interaction with weather pattern flows from the Northwest, a series of unique microclimates develop in the area. Weather at one venue can be quite different from other venues, with differences for such parameters as temperature, wind, precipitation and visibility. It is for this reason that performance of aviation operations in key corridors between venues, as well as at spe-

cific venues, would call for aviation weather data providing real-time information at specific sites of interest.

USAF Aviation Support and TMOS

Local aviation operations for the Olympics were performed by the US Air Force (USAF), with coordination provided by their Aviation Security Operations Center (ASOC) at nearby Hill Air Force Base. The ASOC forecasters provided forecasts and briefings to the pilots. Helicopters from Hill Air Force Base were utilized for security patrols as well as for potential visits to and from the various venues. In support of these operations, USAF weather forecasters from ASOC received forecast information from the US National Weather Service (NWS) Western Region Headquarters. Additionally, they used real-time aviation weather data from deployed USAF portable aviation weather stations at the sports venues and other key locations.

A compact and portable system

These USAF aviation weather stations have the military ➤



Entrance to Snowbasin Ski Area. Site of Alpine Downhill and Super-G.



Mr. Ed Robinson, AFWA contractor and SLC TMOS Team coordinator, checks out TMOS at the Snowbasin site using a handheld display.



Weather office at Snowbasin, overlooking finish line and scoreboard (outside office window). Weather forecaster uses display of weather network information as well as local display from nearby USAF TMOS.

designation of AN/TMQ-53 Tactical Meteorological Observing System (TMOS), and are part of the AF inventory in support of tactical aviation operations worldwide. This system is supplied by Vaisala, and is a configured version of Vaisala's MAWS201M TACMET System. These portable aviation weather stations are compact and quick to deploy. They provide continuous automated data for the following parameters: wind speed and direction (including gusts), air temperature, relative humidity, barometric pressure, liquid precipitation, liquid precipitation equivalent for snow, visibility, cloud height, precipitation type (present weather) and lightning detection, giving range/direction.

The aviation data is viewed on a PC (radio or hardwire link) with MIDAS IV software, providing real-time data as well as METAR/SPECI reporting. A handheld display also provides data/diagnostic information for a direct readout at the weather station.²

Real-time aviation data

The value of TMOS to ASOC

was that they provided reliable real-time aviation data from the venues and other sites, which was an important supplement to the general model forecast data available. The TMOS were deployed at 6 sites: Snowbasin Ski Area (Alpine events), Winter Sports Olympic Park (Bobsleigh, Luge, Ski Jumping), Park City Mountain Resort (Alpine and Snowboard), Soldier Hollow (Biathlon and Cross-Country), the Mountain Pass location between Salt Lake City and Park City, and the Mountain Airport location. With the TMOS, helicopter pilots and others would know exactly what weather conditions were at the specific TMOS sites. Based on a very positive past experience with the TMOS, ASOC felt confident TMOS would be a reliable and useful tool. And it was!

The use of the TMOS at the Olympics was coordinated by Mr. Ed Robinson, a contractor to the Air Force Weather Agency (AFWA) and a former Air Force man. He and members of his TMOS Support Team performed the installations and insured information flow made it back to ASOC. The USAF con-

siders TMOS data of high quality. In addition to its local use at ASOC, the data was forwarded to the USAF Weather Processing Distribution System (WPDS) for worldwide distribution.

USAF's Overall Experience with TMOS

Mr. Ed Robinson has been following the implementation of TMOS from its initial stages of qualification to its current deployment worldwide. He has USAF weather forecasting experience, and has been the point-of-contact from AFWA to the end-users (field people who use the equipment during tactical operations). Mr. Robinson and his colleagues at AFWA are pleased with the very positive reception the TMOS has received from the end-users, including ASOC. Reports back from the field by combat weather personnel involved with the deployment and use of TMOS include statements such as: "The handheld display was easy to program and worked flawlessly, as did the MIDAS IV software. The sensor integration is outstanding." Ed has indicated that, based on his experience as a USAF weather

forecaster and the equipment available in the past, the "AN/TMQ-53 is the best tactical weather equipment that AFWA has fielded in the past 20 years." Vaisala is proud to have its products appreciated by key military organizations, as well as to have been a part of the global stage of Olympic competition. ●

Footnotes

1) An excellent article in the February 2002 Bulletin of the American Meteorological Society Journal describes Weather Support Operations for the 2002 Salt Lake City Winter Games.

2) A more detailed description of the system is provided in the 2001 Vaisala News article: "Versatile Automated Weather Observation for Demanding Military Needs," by Hannu Kokko.

References

1. *Weather Support for the 2002 Winter Olympic and Paralympic Games.* By J. Horel et al. - *Bulletin of the American Meteorological Society: Vol. 83,* pp. 227 - 240.
2. *Versatile Automated Weather Observations for Demanding Tactical Military Needs.* By Hannu Kokko. - *Vaisala News: Vol 155/2001,* pp. 14 - 17.