1.5 **The Frozen Chosen:**
An Overview of Antarctic Support provided by the Department of the Navy

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1. INTRODUCTION

Naval Information Warfare Center Atlantic (NIWC LANT) is an Echelon III activity of the United States Navy dedicated to deliver Information Warfare solutions in support of the Department of the Navy as well as other federal partners to protect national security. Organized over 5 broad departments, 107 integrated product teams (IPTs) have been established to research, develop, install, and sustain information technology and electronic systems capabilities. As part of the Air Traffic Control (ATC) Engineering Division, the Polar Programs IPT in Charleston, SC provides aviation technical services to the United States Antarctic Program (USAP), managed by the National Science Foundation (NSF), under a Memorandum of Agreement (MOA) first established in 1991.

2. BACKGROUND

The United States Navy has had nearly 200 years of history in conducting exploration and supporting research in Antarctica, from the first expedition in 1839 under command of Captain Charles Wilkes to the various voyages conducted by Admiral Richard Byrd from 1929 onward (NHHC, n.d.). In 1955, the US Navy has provided support to US research in Antarctica under the auspices of Operation Deep Freeze I, which continues today as the name of US military support to the NSF. As part of the logistical support provided by US Naval Support Force Antarctica (NSFA) allowed by the Antarctic Treaty, aviation and maritime operations were conducted by US Navy personnel, including ATC and meteorological services, as well as technical support to maintain airfield navigational aids and weather systems (Ground Electronics Maintenance).

In 1985, the predecessor to NIWC LANT (SSC LANT, or Space and Naval Warfare Systems Command – Systems Center Atlantic) installed the first Air Search Radar at McMurdo Station, to assist ATC personnel in managing the immediate airspace surrounding the US's largest logistical hub in Antarctica. In 1997, the NSFA was disestablished, and SSC LANT personnel took on the operational support for aviation operations under the MOA with the NSF, establishing a core team of government personnel overseeing contractors tasked with supporting ATC, meteorology, and ground electronics maintenance, while also maintaining cradle-to-grave engineering support to a wide variety of technical projects in Antarctica. While the command name changed from SSC LANT to NIWC LANT in 2019, the Polar Programs IPT continues to provide outstanding support to the NSF and USAP while developing, delivering, and sustaining new technologies for US research activities in Antarctica.

3. WHAT WE DO

The meteorology branch of the Polar Programs IPT is responsible for collecting and disseminating environmental data in support of USAP operations and activities, including operational meteorological observation and forecasting support as well as climatological records. This support primarily takes the form of aviation weather support through airfield weather observations (METAR), airfield forecasts (TAF), and customized flight weather briefings for military airlift and other aviation customers contracted by the NSF, as well as international partners supporting US operations on a quid-pro-

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quo basis. Medium-range planning forecast support is provided as well to USAP leadership, ensuring safe flight operations both to and from Antarctica as well as on-continent.

General weather information is provided to residents at the US research facilities at McMurdo Station and Palmer Station, including observed weather warnings for high winds, reduced visibility, and extreme wind chills. Forecast support is also provided to research and resupply vessels operating south of 60°S latitude. This includes vessels transiting the Drake Passage between South America and the Antarctic Peninsula, as well as the US Coast Guard icebreaker and chartered cargo and fuel ships tasked with annual resupply efforts to McMurdo Station (the southernmost harbor in Antarctica), and any US sponsored vessels conducting research along the Antarctic coastline. Most support is provided during the Austral Summer months from October through February, but regularly scheduled winter flights and the potential for unscheduled emergency missions create a continual need for planning weather information.

4. WHO WE ARE

As noted earlier, within the Polar Programs IPT a small cadre of government personnel oversee all operational support to the USAP, primarily provided by contractors, while serving as subject-matter-experts for the NSF within their specialties. Currently two meteorologists are charged with overseeing all operational weather support for all US activities within the Antarctic region, while also performing administrative oversight and coordination duties during the active season. This includes establishing and maintaining an organizational structure while identifying and implementing future improvements to the meteorology branch of the Polar Programs IPT. These 2 meteorologists manage 8 full-time and 8 to 10 seasonal contractors, ensuring all assigned tasks are performed in a manner appropriate with identified directives and standards.

A core task of the government meteorology staff is to conduct internal quality assessments of all operational meteorology products produced, evaluating accuracy and applicability on a regular basis, providing beneficial improvements in support to the USAP. Quality assurance evaluation is a requirement by the International Civil Aviation Organization (ICAO) for all aviation functions including meteorology, with the ICAO and World Meteorological Organization (WMO) recommending a quality management system based upon ISO 9000 best practices. Under this recommended framework, the first and second steps of “Plan” and “Do” are defined by operational plans and procedural documents, while the fourth step of “Act” is conducted through policy revisions and engineering efforts. The third step, “Check”, monitors these operational plans and procedures within the first two steps and feeds into the last step.

A robust quality assurance program has been developed over the past decade or so, allowing for honest evaluations of weather support, incorporating best practices from within the NIWC LANT command as well as WMO recommendations utilizing ISO 9001:2008 standards. Evaluations allow for a comprehensive picture to be developed of the program’s performance, evaluating the proficiency of both personnel as well as the efficacy of production within six broad process areas: measurement and analysis, program planning, material management, product standards, technical procedures, and technical solutions. QA tasks are a mix of continual as well as periodic evaluations, utilizing several methods of scoring operational impacts, along with standardized check sheets and customer surveys designed to capture feedback for the wide variety of products from the entire spectrum of users. External program reviews are also conducted triennially utilizing either an outside governing authority and/or industry Subject Matter Expert, as well as upon request by customers through the NSF.

5. FUTURE IMPROVEMENTS

Finally, the MET function also initiates, participates, and assists in the development and acquisition of new meteorology systems and their incorporation into operational weather support for the IPT. The IPT is responsible for installing and maintaining meteorological systems in support of the USAP, including fixed base weather observing systems located at both active McMurdo Station airfields as well as the South Pole Station airfield, automated weather stations throughout the Ross Island and Ross Ice Shelf region, and deployable stations known as the Polar Portable MET Kit issued to researchers and staff stationed at deep field camps during the Austral Summer. The meteorology team becomes the technical advisor to the engineer(s) placed in charge of these new projects and must develop a baseline understanding of the project management process.

Currently the IPT is spearheading the replacement of the current Direct Broadcast Readout System utilized to download and analyze satellite imagery from polar orbiting meteorological satellites (NSF 2024). The meteorology team utilizes this system operationally to formulate weather products and evaluate forecast performance, making this a vital tool. The system includes two ground stations at McMurdo Station and one at Palmer Station that can capture polar satellite imagery from NOAA, DMSP, NASA, and EUMETSAT orbiters, and push it to workstations in both McMurdo and Charleston, SC (Archer 2014). The current system is showing its age, with several critical components in service for well over 20 years (Gavahan 2019). The Polar

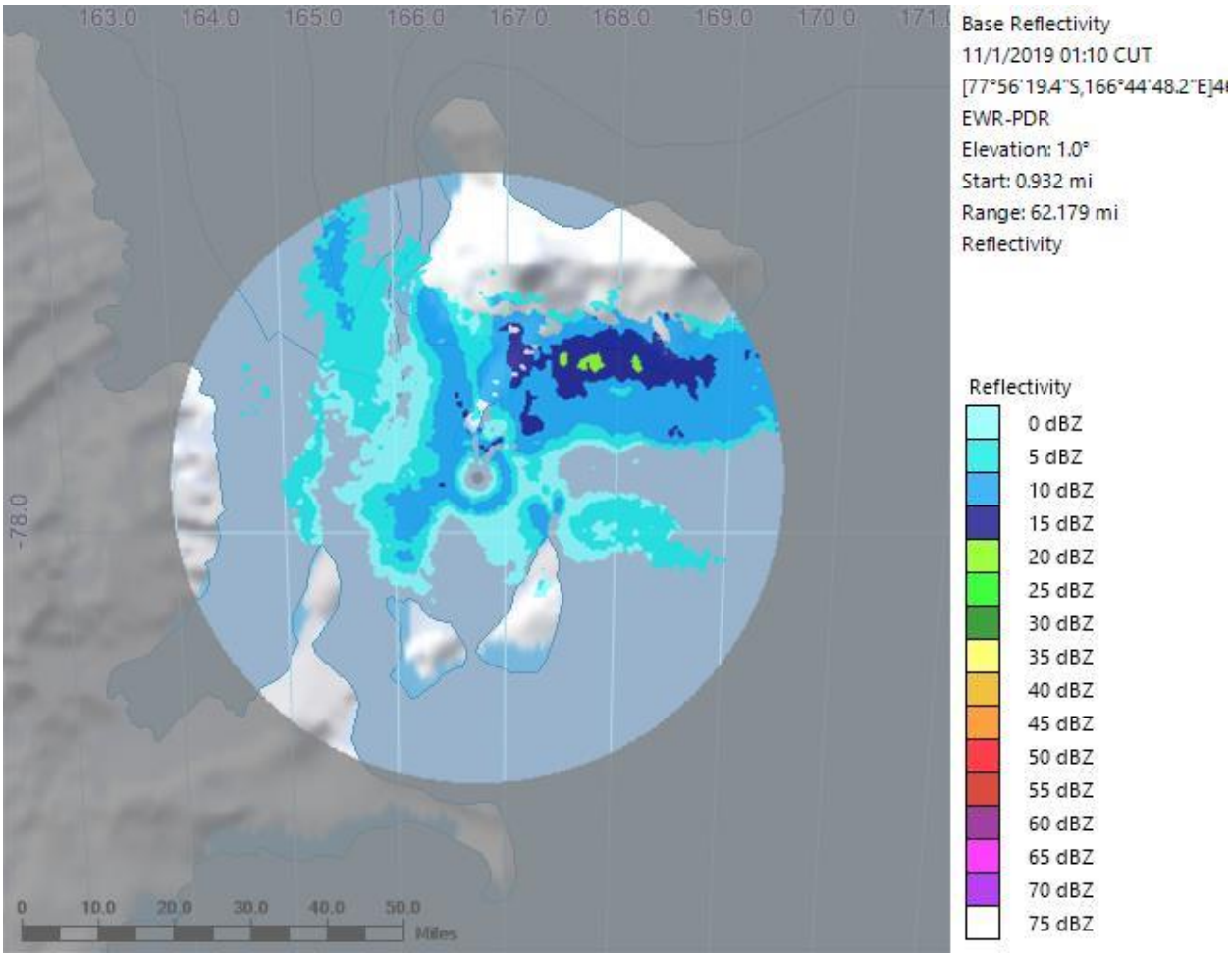


Figure 1 - Base Reflectivity Data from 2019 Portable Doppler Radar Evaluation

Programs IPT is anticipating full operating capability by 2028 (Johnson 2024).

The IPT is also working the as well as the installation of a doppler weather radar system at McMurdo Station (NSF 2024). The Polar Programs IPT has tested a portable Doppler X-Band weather radar system on loan from the US Air Force to evaluate the ability of radar technology to detect local meteorological phenomena in a timely fashion (Snarski 2019). While the harsh continent cut the evaluation short, enough data was collected to confirm the utility of such a system at McMurdo (Snarski 2021), and input from the academic community is helping to shape acquisition plans going forward (Seefeldt et al. 2021). The Polar Programs IPT is anticipating full operating capability by 2027 (Johnson 2024).

6. CHALLENGES

The two meteorologists (classified as 1340) assigned to the Polar Programs IPT are the only two assigned within NIWC LANT. Historically, the IPT has had three personnel (meteorologist or meteorological technician) assigned. While personnel turnover is not frequent, even the loss of one experienced member can lead to a drastic impact in institutional knowledge. Some of this is mitigated by hiring from the existing contractor footprint but is dependent on agency hiring guidelines and practices. The position itself requires frequent and lengthy travel, with regular deployments to Christchurch, New Zealand as well as to McMurdo Station, Antarctica. The meteorology team is also tasked with administrative oversight and support of other functional personnel (ATC, electronics technicians, IT/IA, and others), and serves a point-of-contact for other agencies and NSF leadership while deployed, requiring a general understanding of the broader IPT mission and capabilities. Finally, government meteorology personnel are tasked with evaluating contractor performance, leading to some tension within the functional team.

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