



Human Research Program Antarctic Station Facility Access and Capabilities Information

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**ROI - Flight Analogs
Human Research Program**

NASA FLIGHT ANALOGS PROJECT HERA FACILITY AND CAPABILITIES INFORMATION

This document provides an overview of the Antarctic stations HRP is able to provide access to through an agreement with the National Science Foundation (NSF), including general information regarding their operations, populations and available capabilities for the purpose of preparing research protocols.

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INTRODUCTION

The Flight Analogs (FA) team within the Research Operations and Integration (ROI) element conducts research utilizing ground-based facilities that provide scenarios and environments analogous to those anticipated for exploration missions. The FA team supports the accomplishment of Human Research Program (HRP) objectives by investigating, acquiring, utilizing or operating high fidelity ground analogs of the space exploration environment. The use of high fidelity ground analogs enables the conservation of spaceflight resources while expeditiously and efficiently addressing research questions for future human exploration missions.

The information within this document describes the standard conditions and capabilities provided for experiments performed at three National Science Foundation (NSF) stations located in Antarctica through an agreement between NASA and the NSF, as well as the services provided by FA, NSF, and the US Antarctic Program (USAP). These stations serve as an analog to the spaceflight conditions of physical confinement, social isolation, and environmental danger.

HRP studies conducted under this agreement began in 2016 with 1 to 3 HRP studies deployed each year to the NSF Antarctic stations including McMurdo, Palmer, and Amundsen-Scott South Pole Stations. Studies have been deployed during all portions of the year, but have typically targeted the 8 to 9 month winter-over season during which the stations are more isolated and support a smaller population. Previous HRP studies at these stations under this agreement have focused on individual mental health and adaptation, team functioning over time, sensory stimulation, and the immune system.

STATION FEATURES

Provided below are general descriptions of each of the stations HRP is able to provide access to via NASA's agreement with the NSF.

McMurdo Station



Photo credit: Elaine Hood, NSF

McMurdo Station is the largest station in Antarctica, with over 80 structures and located on the coast approximately 850 miles north of the South Pole and at approximately sea level (~30ft

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elevation). During the austral summer period McMurdo Station may house over 1000 people and during the austral winter period McMurdo Station houses between 150 and 250 people at any given time, with typical periods of 6 to 8 weeks of isolation (between flights) and 24-hour darkness. Internet and voice connectivity is typically available 24/7 depending on weather but does face bandwidth limitations. Over the winter the station population typically consists of a mix of tradespeople, management, medical, and limited scientific support personnel.

Palmer Station



Photo credit: Mike Lucibella, NSF

Palmer Station is a small coastal station at approximately sea level (~65ft elevation). The station consists of two primary buildings supported by three small out-buildings. The station population during the austral summer is between 40 and 50 people, with the austral winter population typically limited to 15 to 20 individuals and the typical winter isolation period (with no ships in or out of the station) lasts approximately 8 months. Internet and voice connectivity is typically available 24/7 depending on weather but does face bandwidth limitations. Over the winter the station population typically consists of a mix of tradespeople, management, medical, and scientific support personnel.

Amundsen-Scott South Pole Station



Photo credit: Mike Lucibella, NSF

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Amundsen-Scott South Pole Station is located at the geographic South Pole at over 9000 feet of elevation atop the Antarctic ice sheet. The station itself consists of two primary buildings supported by multiple small out-buildings. The station population during the summer may reach as many as 150 people while the winter population is typically between 40 and 50 people, with the typical winter period of isolation (no scheduled transportation in or out of the station) lasting 8 to 9 months. Internet and voice connectivity is often limited to being available approximately one third of each day depending on weather and with bandwidth limitations. The station population is again a mix of tradespeople, management, medical, and scientific personnel.

STANDARDS AND CAPABILITIES

This section describes general operational standards and limitations researchers should be aware of when designing research to deploy to the NSF Antarctic stations.

- Research is supported on-site at the stations by UTMB/USAP physicians and physicians assistants as available. Researchers should not plan or expect to travel to or conduct any on site activities at the stations. All support from the study team should be provided remotely. Researchers will be able to maintain direct communications with the physicians supporting their studies for the purposes of study coordination.
- Study participants are recruited from personnel at the stations during the relevant season. These personnel are at the stations for professional purposes primarily (e.g., conducting their own research, station management and support, maintenance, provision of medical care, etc.). Time to participate in research outside of nominal professional duties is limited as a result and should be considered in study design.
- Hardware may be shipped to support study requirements but does require earlier preparation for deployment given transit time to Antarctica and must be limited in size (e.g., pelican cases) given limited available volume on transport planes and ships used for Antarctic transit.
- Internet access is typically available at least part of each day, depending on weather, but connectivity may not be consistent and bandwidth will be constrained. Study and software design should take into account the high likelihood of connectivity losses including the possibility of loss of connectivity mid-session.
- Computers are available at the stations for limited research use. Personal devices may also be available for use by station personnel to access certain study activities (e.g., surveys) but availability of personal devices is inconsistent and use for research is up to station personnel discretion. Significant computing needs, in terms of time requirements and/or hardware capabilities, may require the study team to provide and ship the necessary computer resources to support their study (e.g., laptops, tablets).
- On site capabilities are typically in place to support biological sampling as required (e.g., blood draws, saliva sampling, etc.) including temperature maintenance of the relevant samples. Storage space is limited however and sample logistics (e.g., frequency, volume, etc.) should be closely considered in designing the study.
- Studies typically need a general protocol well defined 6-9 months prior to study implementation for submission to the NSF and IRB approval for study implementation 4-6 months prior to subject recruitment and consenting.

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- Feasibility of all aspects of each study will be evaluated by ROI, the NSF, and the USAP prior to implementation of the study at the relevant station(s). In the event a study is determined not to be feasible it may be required to be rescoped before implementation or it may be determined not to be implementable at the stations.
- While researchers may recommend which station they believe is the best fit for their study, ROI and NSF will work with the researcher to identify the appropriate station(s) for a given study based on that study's requirements.