

W.N. Kellogg

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Final Report on the Operation of the United States Research
Facility, "Palmer Station", Antarctica, (64° 46' 01" S; 54°
04' 39" W). February 25th 1965 to January 8th 1967.

From: A. S. Rundle,
Station Scientific Leader,
Palmer Station, 1965 & 1966.

To: Dr. T. O. Jones,
Director,
Division of Environmental Sciences,
Office of Antarctic Programs,
The National Science Foundation,
Washington, D. C. 20550

Dated: JUN 20 1967

Signed:

A. S. Rundle

PREFACE

This report covers the time period from the original commissioning of Palmer Station in February 1965 to January 4, 1967, when I was officially relieved as Station Scientific Leader, Palmer Station.

ACKNOWLEDGEMENTS

The success of Palmer Station, as an Antarctic research facility, could not have been realized without the untiring efforts of the many men who built it and assisted in its maintenance and improvement. Let it be recorded, that in behalf of the scientific community, so far associated with Palmer Station, I extend grateful thanks to the officers and men of the U. S. Navy and U. S. Coast Guard, who made this operation possible.

In particular, our thanks are due to:

Commander N. E. Hickson USN, Commanding Officer, USS Edisto (AGB 2)
Captain W. M. Benkert USCG, Commanding Officer, USCGC Elstwind (WAGB 279)
Captain F. A. Goettel USCG, Commanding Officer, USCGC Westwind (WAGB 281)

Introduction

Palmer Station was established in February 1965, as a support facility for scientific research, under the auspices of the United States Antarctic Research Program. Its construction was carried out by a small detachment from the U. S. Naval Mobile Construction Battalion Six (MCB 6), and by the officers and men of USS Blisto (AGB 2). The scientific disciplines undertaken at the station have been, Biology, Geology, Glaciology and Meteorology, with associated smaller research projects.

Formal Establishment and Subsequent Operations

The station was operational and independent by February 24, 1965, and was officially dedicated at 1500 hrs, February 25, 1965, in a ceremony conducted by Commander N. E. Nickerson, USN, Commanding Officer USS Blisto (AGB 2), Commander, Task Unit 43.5.1. At the dedication, Commander Nickerson said:

"As we are about to establish this station, the newest on the Antarctic Continent and the only United States station in the Antarctic Peninsula area, it is only fitting that we should invoke the blessings of God"

"O Almighty and Everlasting God, we invoke Thy favor upon us as we gather to dedicate this station. We dedicate this station to those who planned and worked towards its completion, and to the skilled men who will make worthy its purpose by honest and hard labor. We dedicate this station to our native land and to all mankind. We dedicate this station to You, O Lord God, Almighty and Most Merciful, Whom all the temples of the earth cannot contain, yet Who is delighted when men glorify Thee in all their doings. Bless this occasion with Thy spirit and give unto all of us a sense of the dignity and honor of honest toil when we labor for our God, our world, our country and our neighbor" Amen.

"Today we have reached the culmination of our efforts to construct and make operable this newest of our Antarctic stations. The effort and enthusiasm displayed throughout this operation has been of the highest order. The work

involved ranged from the most difficult manual labor to the utilization of several highly technical skills. Its successful completion, nearly two weeks ahead of schedule is indicative of the spirit which has prevailed since our arrival and is particularly significant in view of the manifold logistics problems encountered."

"The opportunity afforded during this operation for the military to work in such close proximity to the scientific community, has been most stimulating and should result in an increased awareness of each others' capabilities and contribution."

"The decision to call this activity Palmer Station is most appropriate. On November 17, 1820, Captain Nathaniel Brown Palmer, of the sloop Herc, out of Connecticut, sailed from Deception Island to the southward and on the following day drew close to the mainland shore. This represented the first sighting of the Antarctic mainland. He became familiar with the Peninsula area and for many years the Antarctic Peninsula was called Palmer Peninsula in his honor. It is therefore, most fitting that this activity be established under the name, PALMER STATION, 145 years after Captain N. B. Palmer first sailed these waters."

"Mr. Arthur Rundle, Palmer Station Scientific Leader, to you I give my sincerest wishes for success in the scientific endeavors of you and your associates."

"Chief Petty Officer Axworthy, Petty Officer-in-Charge of Palmer Station, to you my sincerest wishes for a safe and successful wintering over season."

"As Commanding Officer, USS Aristo (AGB 2) and Commander, Task Unit 43.5.1, in accordance with Commander Task Force Forty-Three Operation Order No. 1-64, Deep Freeze 65, and on behalf of the Task Force Commander, RADM

J. R. Ready, I hereby declare Palmer Station established." (At this point, the Station Colors were hoisted).

"I stand ready to be relieved of custody of Palmer Station and to transfer responsibility for its operation and maintenance through you, to Commander, Antarctic Support Activity."

Charles S. Anworthy, MMC USN, then assumed command of Palmer Station and said: "Captain Nickerson, Officers and Men of USS Paigee and MCB-6.

At this time, I would like to thank you on behalf of Commander, Task Group 43, myself, Mr. Rundle and the remainder of the personnel, both military and civilian, who constitute the Winter Over Party. You undertook and completed an arduous task, with a willingness which reflects credit upon yourselves and your command. Your performance was in keeping with the highest traditions of the Naval Service. After the ceremony is concluded, you are all invited to tour the station before returning to the ship. Mr. Rundle will now have a few well chosen words. Thank you all again."

Arthur S. Rundle then entered the capacity of Station Scientific Leader, Palmer Station: "Captain Nickerson, Gentlemen: The new station which we have dedicated today is one of many, operated under the United States Flag in Antarctica. It was designed and built specifically for the pursuit of scientific research. That it be named for an American, and one of Antarctica's earliest explorers is appropriate."

"There is no power on Earth so valuable and influential as knowledge, and full knowledge and understanding of the planet on which we live, is what mankind should seek. Antarctica is relatively unknown and forms a potential gap in our knowledge of the Earth. It is at stations like Palmer Station, that these gaps are being filled."

Today, Palmer Station is small, but the area in which it is situated has great potential for scientific research. I feel sure that in the future years Palmer Station will grow in size and that today we have not only dedicated a new station, but have laid the foundation for something greater."

"That all this has been made possible is, in the final analysis, the result of great efforts by the officers and men of USS Raisto and MCB-6. On behalf of the scientific personnel and the National Science Foundation, I thank you all."

General Appraisal of the Station Installation

It has been my impression from the very start, that the decision to construct Palmer Station was made too hasty, and that insufficient time was available to thoroughly plan the station layout and its equipment needs. Indeed, it is possible, that were it not for the tremendous efforts and ingenuity of the men from MCR-6 and the crew of USS Edisto, the station might not have been commissioned at all. Too many vital items were lacking, in the first instance, and had to be manufactured in the workshops of USS Edisto, or purchased in Punta Arenas when USS Edisto made an unscheduled turnaround trip.

The domestic building, though adequate for short term occupation, is not ideally suited to the type of climate prevailing in the Antarctic Peninsula area. It was not waterproof, and considerable work was required during the winter of 1965 to seal the panel joints in the roof, northern end and north-eastern wall of the structure. This waterproofing was completed by crewmen of USCGC Eastwind (WAGB 279), using tar and tar-paper, during the summer of 1965. However, storm damage to this covering, necessitated almost constant attention during the 1966 winter.

The foundation of the building is not satisfactory, and the aluminum trusses, placed on a graded rock and soil base, have not proven stable. Evidence of floor shifting now shows in several parts of the building. More careful consideration of the use of concrete in the construction, would have been desirable. It is difficult to estimate the degree of deterioration of the foundation structure, but it would seem advisable to inspect this in the summer of 1967-68.

From the point of view of this occupant, the domestic building falls far short of what might be considered desirable, and moreover, feasible, in modern Antarctic living quarters. The building has far too little headroom and a 10 ft. overhead would have been preferable to the 8 ft one installed. With a 10 ft overhead, it would have been possible to fit a false ceiling and cover the exposed central heating ducts and electrical wiring, all of which are clumsy and sloppy in appearance. The main central heating duct, placed below the roof trusses, is most unattractive, and proved hazardous to the taller members of the community. Mr. Peckham, in particular, suffered frequent cuts and bruises on the head, when he omitted to duck while moving about the room. The furnace itself, was badly placed (probably by necessity, because the associated ducts were pre-cut and could not be reorganized), and occupied too much of the limited space in the living room. In any case, one does not like to live with ones plumbing system.

Perhaps the most conspicuous oversight of all, was the failure to provide furniture for the station in 1965, and when this failure was repeated in 1966, one can only wonder at the seriousness with which Palmer Station, and perhaps Operation Deep Freeze in general, is regarded by the organizing authorities. The furniture manufactured by USS Edisto was functional only, and I frequently wondered what our numerous visitors thought. When this was replaced with furniture from USCGC Eastwind, the station interior did have a more attractive appearance, but the domestic quarters are so small as to point up the unsuitability of the rather large, armed chairs we received. Happily, furniture did arrive in the 1967 resupply, but only two tables and eight chairs, which, being of tubular steel manufacture, were not what we had anticipated. I feel sure that the wintering 1967 group will agree, that when one cannot

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change ones domestic environment by moving from one room to another, more tasteful furnishings are desirable. My overall impression is that the domestic building is more of an electronic hut, than an Antarctic "home".

The biology laboratory during 1965, left much to be desired as a research building. It was badly organized, lacked adequate storage space, was extremely difficult to keep clean and in some respects was inadequately equipped.

At the time of departure of USS Edisto on February 28 1965, the biology laboratory, though functional, was unfinished. A few days of additional work would have made it much more habitable. Had the need been recognized earlier, at the time of USS Edisto's trip to Punta Arenas, it might have been possible to procure certain desirable items, the most significant of which was some 500 sq ft of linoleum or vinyl floor tile.

As it was, only one strip of linoleum was available for the floor of the laboratory, and this was placed down the center of the room, which left wide sections of bare wooden boards. This was extremely unsightly and impossible to keep clean, especially in view of the very limited supply of water in the laboratory. Fortunately, the nature of the work carried out during 1965, did not demand exceptionally clean conditions. However, many of our visitors from other stations were biologists, and one can only wonder what they thought when they saw our facilities.

The British cooking range and snow melter system were not removed from the building as they were regarded to be of potential value in case of emergency. However, there was no good reason for its having been left exposed by the construction workers. Adequate plywood and construction timbers were available to box-in this equipment, and Mr. Lippert made a

gallant effort to do this. Unfortunately, Mr. Lippert's craftsmanship in this field is not the best, so the Station Scientific Leader joined him in constructing a flush panelled cupboard and deck of drawers over the stove. It is surprising what a difference this small alteration made to the general appearance of the laboratory.

The initial organization of the plumbing system was quite unrealistic. Only one set of water lines had been installed and this was to carry cold water only. However, no provision had been made to supply the laboratory with water anyway. Furthermore, the water lines were placed on both sides of the room with faucets appearing where no sinks existed. No provision had been made for a hot water system, which would seem to be a prime requirement in a biological laboratory. The only way in which hot water could have been made, would have been to fire the old British cooking range and melt snow in the small, associated snow melter. This would have required solid fuel, which was in short supply at the station, and so was kept for emergency only. In any case, open fire of this kind was contrary to the policy which Chief Anworthy and I wished to follow. Thus, when hot water was needed, it was made in a chemical flask, heated by a small Coleman Stove.

No permanent water connection existed between the main building and the biology laboratory so in order to maintain a small supply of cold water, a flexible rubber hose was run out at approximately weekly intervals, and water was pumped from the main snow-melter tanks to a small, 100 gallon tank, in the upper storey of the biology laboratory building. Chief Ferguson is to be thanked for rendering this service during 1965 and Mr. Peckham is to be commended for having maintained the supply, during much of 1966.

This ridiculous situation should have been alleviated in the summer of 1966, but the wrong size fittings had been delivered with the copper pipe, which was to have been used to establish a water connection. In any case, the insulation which arrived was also the wrong size. All attempts by the crew of USCGC Kasbwind, to braze or weld the pipe sections together, failed, and upon their departure, I was of the understanding that Chief Wrigley was to complete the project, after making new fittings. I am sorry to say that only the fittings were made, and it remained for the Station Scientific Leader, with Mr. Peckham's help, to attempt the construction. Unfortunately, by July when the attempt was made, temperatures were so low, that heat could not be maintained in the pipe sections, and the joints failed. Eventually the project was closed by heavy snowfalls. However, I believe that this water line connection has now been established and that the laboratory is now amply supplied.

Internally, the hot water system which was installed in the summer of 1966, has proven very successful, and once cold water was available in the upper storage tank, adequate, instant hot water was on hand. During 1966 also, the redundant water line on the north-eastern side of the laboratory, was removed and placed on the opposite side, and serves as the hot water carrier.

A major drawback to the convenient operation of Palmer Station so far, has been the critical lack of inside storage space. The climate around the station is such that no material should be stored outside. Precipitation falls in the form of rain in summer, and rain showers during the winter are not uncommon.

During 1965, one 20 ft long jakesway was available for storage. This had been brought over from site Bravo, On Bonapart Point, during the initial

construction of the station. In it was stored the entire USAMP supply, including field gear, food and scientific equipment. One quarter of the floor area was turned over for the storage of navy dry food supplies. After the 1966 resupply items had been added, the weight was so great, that the floor eventually sagged and sprung the blankets from the arches. This called for constant attention (without success) during the 1966 winter, and eventually, the entire structure was rebuilt by crewmen from USCGC Eastwind (WAGB 281), and the navy supplies were removed.

The northern half of the upper story of the biology building was also utilized for food storage, and again, the floor was overloaded and some material had to be removed when the sagging floor ruptured the water line which supplied the laboratory. Ironically, the holding tank was full at this time, and a 100 gallon flood inundated the room below.

The remaining food supplies, including emergency rations were stored in the central passage-way of the domestic building, or were left outside, still unpacked. The end result of the storage problem was, that considerable quantities of paper products, like towels, napkins, toilet rolls, etc. were water damaged beyond use, and large quantities of beer were regarded as unsalable because the cans had rusted. Many boxes, still unopened in January 1967, have contents of now unknown quality.

The storage situation was improved considerably with the delivery, in January 1966, of four connex boxes and part of a janesway. After crewmen from the USCGC Eastwind had manufactured arches for the janesway, the remaining food supplies were placed under cover, together with a quantity of sleeping bags, bedding and domestic supplies. Shelves were fitted in the connex boxes, and all but the fire fighting equipment, beer and plumbing and electrical

supplies were placed inside. However, considerable bulky material remained outside (and significantly, this included all supplies of Ansul powder and nitrogen cylinders), and when needed, considerable digging was required.

Basically, the problem lies with two causes. In the first place, insufficient space was available and secondly, the station was grossly overstocked. The cold room for example, at the time of resupply, is so full that the community must literally "eat its way" to certain items. It is to be recommended, that because of the relatively easy access to Palmer Station by ice breaker, the stocked supplies be reduced to a 15 month level. It is unlikely that the provision of yet another janesway in 1967, will totally alleviate the situation, as this will allow only a spreading-out of existing material for its more ready availability, and my recommendation is the provision of yet another 20 ft long janesway, if this material is to remain at the old Palmer Station site.

Station Operations

The day to day routine of Palmer Station was the concern and responsibility of every individual, but because of professional qualifications, a limited division of labor was established. However, the overall success of any small station lies with the quality of the entire community.

Palmer Station has operated successfully in the face of many setbacks and minor problems, some of which are to be expected in such circumstances. 1965 was a most successful year and reflects, in particular, the very high professional character of the Navy Support Force personnel. I can express the greatest admiration and offer only words of praise for their efforts.

Chief Axworthy was a leader of extreme high quality and was supported by three men, each of whom were eventually advanced to the rate of Chief Petty Officer. These three men, Chiefs Adkins, Cummings and Ferguson, had all wintered-over before and knew what to expect and what was expected of them. Regretably, the USARP personnel had only one representative with previous experience, namely the Station Scientific Leader, but the scientific group quickly meshed with the naval personnel.

All except chief Adkins shared in the duty of mess cooking and house cleaning and only the minor grumbles of un-domesticated men were heard. Chief Ferguson took on the entire task of station maintenance and of keeping the station supplied with water. Chief Cummings put in endless hours in the radio shack keeping communication lines open, and with the help of his wife in California, kept up a continual stream of amateur radio contacts, to the great satisfaction of everyone in the station. In the capacity of "ham" operator, Chief Adkins spent almost every night in the radio shack and supplemented the efforts of chief Cummings.

Chief Anworthy, as a hospital corpsman, was the least employed, professionally, and whose major task was to remove one member's tooth. He was therefore, able to devote maximum time to the general administration of the station, the operation of the ship store, the showing of the movie, and being very safety conscious, maintained a night fire watch for most of the year.

Under these conditions, the scientific program was able to proceed, totally unencumbered by unnecessary activities, and maximum effort could be applied to the scientific endeavor. The end result was a most harmonious and pleasant existence.

There were no overwhelming problems or disputes during 1966 and a domestic division of labor was established, similar to that of 1965. Fortunately, our record of having no serious accidents or emergencies was maintained. However, the calibre of the group was noticeably lower than during the previous year. Of particular note, is the fact that the station was often short of water during the early months, and it was not until after I had talked with chief Skelly, after having rejected as impractical, Mr. Beckham's request for instruction in the operation of the tractor, that adequate water was available. Upon this improvement, it proved possible to allow each person to take two showers a week, which in itself was an improvement over the 1965 system.

Likewise in the early months, the engine room was maintained in a particularly disgusting (and hazardous) condition, often with diesel and sump oil laying on the deck. I never was really satisfied with the state of the generator room, even after my request for an improvement had received attention.

I was personally disappointed in the general lack of concern, by every one, for the state of the station as a whole, and in particular, the slowness

with which repairs and maintenance were executed. I also feel that Brown and I spent too much time making repairs to our broken vehicle and in manufacturing parts and equipment for this. The only favorable outcome was that first, the job was completed as quickly as time allowed and my personal proficiency as a welder improved magnificently.

As Scientific Leader, I had concern, on several occasions, for the behavior of certain personnel, in particular, the implications and possible consequences of their social habits. I was especially concerned that, to my knowledge, fire drills were never held and that (as far as I know) only one demonstration in the use of the fire fighting equipment was carried out. I was not present at this demonstration. A high degree of competency was evident on the several occasions of false fire alarms, created by heat build-up in the engine room and rapid temperature changes in the central passageway, when the engine room door was opened.

This contrasted markedly with the previous year, when Chief Axworthy would deliberately apply heat to the fire buttons to keep everyone on their toes. It was refreshing then, to observe the speed, with which every one executed his pre-assigned duties, and to note the effectiveness of the inter-building telephone system.

Sadly, my several requests of chief Skelly, during 1966, for similar drills were never favored and I believe, that had a fire actually existed we would not have coped with it efficiently. With this in mind, I can only suggest that fire drills similar to those held in 1965, be demanded, in heavy type, in the Naval Operation Order, as it applies to Palmer Station.

These problems notwithstanding, the year of 1966 did progress rapidly, in a generally pleasant atmosphere of friendship and cordiality, and thankfully without mishap. However, these experiences emphasize my belief that

Communications

Radio communications at Palmer Station have never been satisfactory and considerable attention to this matter is needed, if the problems are to be overcome.

During both 1965 and 1966 the radio operators expressed dissatisfaction with their equipment, and with their official, primary contact, Navconsta Balboa. Very frequently, atmospheric conditions were such that contact with Balboa was impossible, and message traffic, both incoming and outgoing, accumulated in large quantities.

A summary of the radio men's experiences follows and I am grateful to V. L. Nance RML USN, radio man for Deep Freeze 1966, for supplying me with information. It is based on a detailed log, which Mr. Nance agreed to keep. This is now at Palmer Station, and is available, should any interested party be concerned with its content. Mr. Nance also reported to his superiors in McMurdo Station in January 1967.

During 1966, Palmer Station operated one-operator schedules with Balboa, and used the ship/shore method for passing outgoing traffic. The one-operator broadcast, for incoming traffic, was copied on frequencies, 17697.5 Kcs, 11080 Kcs and 5448.5 Kcs. Outgoing, on ship/shore, utilized 12867 Kcs. When these circuits failed, other schedules had to be kept in an attempt to maintain communications.

Daily contacts were maintained with the British Station at Argentine Islands, and was made on split frequencies; 4067 Kcs receive and 4550 Kcs transmit. During winter time, when contact with Balboa proved impossible, a schedule with Port Stanley was maintained, again on split frequencies; 3975 Kcs (CW) transmit and 9100 Kcs (CW) receive. These schedules were kept

in the Antarctic, particularly in wintering conditions, there is no good substitute for previous Antarctic experience.

on Mondays and Thursdays. Daily schedules were also kept with exact timing on frequencies 11295 Kcs, 7995 Kcs and 8997 Kcs. These contacts were for intra-continental communications and also for passing out-going traffic. AFRES was copied on 15.430 Mcs for daily news and sports. The amateur bands were utilized with great success for personal traffic and recreation.

Balboa (A). Bravo-Mike Broadcast: The Bravo-Mike Broadcast, utilized for all incoming traffic, was found to be most unsatisfactory, and, moreover, was the only means of receiving traffic. Operators were found to be of low professional calibre and this, coupled with poor atmospheric conditions, made receiving a difficult and exasperating experience. For year-round contact, frequencies 17697.5 Kcs and 11080 Kcs proved to be the best, though in winter, 5448.5 Kcs was an excellent back-up frequency. The best times of day for copying the broadcast were 2000Z and 0200Z. The major problems experienced with the broadcast were, bad keying (faulty keying relays), too slow a sending speed, typing errors when cutting broadcast tapes and failure to service garbled messages (note: Balboa will retransmit a message as received, even though it is indecipherable). In addition, the broadcast often was off-frequency.

Balboa (B). Ship/Shore: The only suitable frequency found for outgoing traffic to Balboa, was 12867 Kcs. Other frequencies were provided for this contact but success was achieved on none of them. The ship/shore method for passing traffic was good from mid-October to mid-March only. Outside of this period, communication with Balboa was nil and other channels had to be used.

Byrd Station: After losing ship/air communications with Halibut, communications were set up with Byrd Station for outgoing traffic and intra-continent messages (for example, the chess tournament). Frequencies 21250 and 7995 Kcs proved to be the most suitable, and after all aircraft had departed the continent, 3997 Kcs (air/ground) was found to be excellent for communication with Byrd Station and McMurdo Station. The best times for intra-continent communications proved to be between 1700Z-2300Z. The Byrd Station schedule was set up for Mondays and Thursdays at 1430Z and proved to be very reliable.

Argentina Island (ZHF44): Daily schedules were kept with ZHF44 on 4553 Kcs (transmit) and 4067 Kcs (receive) and provided communications almost up to telephone standards. These contacts were extremely valuable, as outgoing traffic could be sent via Port Stanley. On many difficult occasions, this channel was used, but due to considerable delays, it is suspected that our invasions overloaded Port Stanley's facilities.

Amateur Radio (KC4USP): From October to April the station used 20 m and 15 m for amateur contact, and no problems were encountered. The 40 m band was used for the remainder of the year. 40 m gave a strong signal in the early morning hours but unfortunately, was difficult to "phone-patch", because of associated static and atmospheric noise.

AFRS: The Armed Forces Radio and Television Service was copied without any problems throughout the year. The signal was "patched" into the speaker system in the domestic building and provided news, sports and stock report information for the station personnel.

Some improvement, particularly from the point of view of the operator at Palmer Station, may be experienced during 1967. The British Antarctic

Survey, was good enough to supply Palmer Station with a CREED machine, (automatic CW keyer). This will allow Palmer Station to be accommodated into the British communications system, and will speed up operations. To date, all outgoing traffic has been by CW, but the new machine will allow a tape to be cut, and the signal to be transmitted either to Argentine Islands or to Port Stanley direct. Communications with Port Stanley are excellent throughout the year.

Recommendations

The station is now using KWM2A transceivers and 30S1 linear amplifiers for all outgoing communications. This equipment is manufactured by the Collins Company. It is recommended that separate transmitters and receivers be supplied. For example, URC/32, FRT/2 for transmitters and the R-390 receivers. The KWM2A/30S1 combination should be used for amateur operations only. A further recommendation is that the amateur facility be physically separated from the naval communications system. The present organization leads to confusion (and often unrest) because of inability to operate both systems at the same time.

There are four antennas in service at the present time: Sloping Vee, Conical Monopole (4-18 Mcs) and two Dipoles, one for 4553 Kcs (British ground/air), the other for 2716 (harbor common). The Vee and Monopole are the only ones suitable for long range communications, and the Monopole is the only antenna which can be used for intra-continental traffic. It is suggested that a directional antenna be installed for Palmer/McMurdo contacts, and that a separate antenna be provided for the amateur rig.

The failure of Balboa as a suitable radio contact and the manner with which Port Stanley can be reached, led to the suggestion that Port Stanley become the primary contact for Palmer Station. Heliograph is now installed at Port Stanley, and Palmer Station were similarly equipped, communications would probably be very successful. In view of the build-up due to take place at Palmer Station in the very near future, as well as the possibility that future operations might lead to an increase in radio traffic, this would seem to be a most desirable system. It might prove necessary to deploy one U. S. Navy radioman to Port Stanley, to share in the operations, but this would be a useful international exchange.

The Scientific Program

The principal disciplines, biology and glaciology, undertaken at Palmer Station, both suffered, particularly in the early stages, from a lack of basic information on general environmental conditions in the Palmer Station area. The hasty installation of the station, allowed only limited program planning and prevented any first hand reconnaissance of the area, by the individuals concerned.

Biology 1965. Mr. J. Strong and Mr. G. Lippert - Bernice P. Bishop
Museum

The main objective of the program was to make a biological survey of the area around Palmer Station, with particular emphasis on an evaluation of the terrestrial micro-funa, and its relationship to the prevailing micro-meteorological environment. Additional studies carried out, whenever possible, included the collection and study of local marine organisms. A bird census was made in the summer of 1965 and large numbers of Saint Petrels and Skuas were banded. The bird count, together with recording of the local seal population, was continued throughout the winter.

The area covered by these studies extended over both the Norsa and Bonaparte Point promontories, and over Humble, Lichfield, Breaker and Torgerson Islands, that is to say, the area immediately surrounding Arthur Harbor. Occasionally, when conditions permitted, trips were made to more distant locations in the vicinity of Janus Island. One visit was made to a small rock outcrop in the mountains, some 15 miles SE of Palmer Station.

It must be said at the outset, that the program was not as fruitful as any of us would have wished. A terrestrially oriented research program is not well suited to the local environmental conditions.

In the early season the program was hindered least, because the open sea allowed small boat operations around the Arthur Harbor area, and for the time period extending through May, collection of material was relatively easy because of exposed sea surface. The whole program slowed down, and was even halted for a time during the winter, when snow began to accumulate in massive quantities. Under these conditions, it proved almost impossible to keep the collecting sites studied as open.

Sea conditions during the winter were quite unfavorable for movement to nearby areas, as the ice concentration prevented the use of small boats, yet was never safe enough to cross the strait.

It was not until September, when a little snow melt occurred, that the field program was able to get underway again, but it was not fully productive until December, when snow melt began in earnest.

The program was such that it called for precisely the type of work which was most easily hindered by the weather, and too little planning had gone into the use of the laboratory. It would appear more logical to have made massive collections of material during the summer, and to have stored this for later laboratory study, but the problem involved here was the lack of cold storage space. The laboratory was equipped with a refrigerator supplied by USS Edisto, and it rarely functioned reliably. Space in the walk-in reefer, in the main building, was very limited until much of the food had been consumed.

In an attempt to alleviate the problem, an eight feet cubic "cold" room was constructed outside, and it was planned to use this for low temperature storage and experimental work. Temperature fluctuations were so great however, that the structure proved almost useless.

The conclusions to be drawn from this first years experience are, that basically, the wrong type of research program was attempted, in that climatic conditions limited the productivity of the research effort. Facilities were too limited and too much time was consumed "jury-rigging" equipment.

However, I feel satisfied that Mr. Strong and Mr. Lippert made the most of their opportunities in the face of many obstacles.

Biology 1966. Mr. V. Peckham - Lewis T. Bishop Museum

Though Mr. Peckham's program was basically a continuation of the entomology program begun in 1965, he fared a little better. He was able to draw upon the experience of the 1965 research group, and could therefore tailor his program to better fit the working conditions. In spite of this, the nature of his work still required numerous outside measurements and winter collection, and as was the case in 1965, he found the heavy snowfall to be a great hindrance.

He was, however, better equipped and had access to the large toploading deep freezer, supplied for the glaciology program, in which to store material. In addition, his working facilities were clean and comfortable and easy to maintain. His need to manufacture equipment was also much less than had been Mr. Strong's. The entire program, being more physiologically oriented, allowed for much more time to be productively spent in the laboratory.

I feel sure that the results of Mr. Peckham's work will prove interesting and stimulating, and it is regrettable that his untimely departure from Palmer Station, in December 1966, prevented him from nicely rounding-off his research effort.

The overall research effort, for the two year period, especially when coupled with the summer biological work, should prove to be a valuable,

exploratory study of the biological research potential of the Palmer Station area.

Summer Biological Activities

The scope and value of the Palmer Station area for biological research, will be appreciated after the scientific results have been published, but I am sure that the results of the summer work, carried out by Florida State University and the University of Miami, will be the most encouraging, and will bring to light many significant facts about research possibilities in this area.

During the summer, meteorological conditions allow prolonged activity in the field, and make for easy access to study areas. Moreover, the transportation facilities made available by the supporting ice breakers, give the biology program extremely wide and flexible working conditions. I estimate that research productivity during the summer months, exceeds that of the winter period, by several hundred percent.

These general observations of biological research activities would seem to have significance for planning future operations. Terrestrially oriented biological research will be more fruitful, if considered as a summer activity only, but if workers in the field of, for example, entomology should again participate in the winter program, they will be more satisfied with their efforts if they plan to do most, if not all, their collecting and general outside field work during the summer, and reserve, as much as possible, their laboratory work, for the winter period. This might call for an increase in cold storage facilities.

The more obvious research to undertake would appear to be that which is marine oriented, and the recent introduction of marine studies by the Virginia

Institute of Marine Sciences, should prove to be a rewarding development. The sea is generally accessible to small boat, certainly from mid-November through April, and rarely would small boat operations be hampered by the weather. Once the ice has become firm enough to walk on (which was the case during much of the 1966 winter), a marine program could continue. The only obstacle to overcome and therefore, seem to be a sea ice condition similar to that of 1965, when ice prevented small boat operations, yet was never safe enough for travel on foot.

Disregarding, for the moment, any unforeseen operating problems with the proposed trawler, it appears that the value of this vessel will be very great. It should prove invaluable as a "trawler" for the terrestrial biologists, and its value for marine research is, of course, indisputable.

Extensive use has been made, during two summers, of the Greenland cruiser, brought to the area by the ice trawler. During the 1967 summer, this vessel ranged as far as Argentine Islands and Almirante Brown Station in the Neumayer Channel. The number of scientists, in disciplines outside biology, who participated in these trips testifies to the usefulness of this craft. In particular, its usefulness lies in its ability to put small parties ashore, in difficult locations.

Should funds become available, and if a similar craft is not planned for the main trawler operation, it would seem a worthwhile recommendation that a similarly sea worthy vessel, some 20-25 feet long, be supplied for the Palmer Station operation. If protection were offered, in the form of a rail slipway, a vessel of this type could winter at Palmer Station, and furthermore, for prolonged summer operations, a junior Naval or Coast Guard officer would be amply qualified to command it at sea.

Glaciology - Mr. A. S. Rundle, with assistance from Mr. C. Plummer, Mr. Mr. W. Armstrong, Mr. L. Brown and Mr. S. DeWitt - Ohio State University

The object of the glaciological research program was to make field measurements for an assessment of the mass balance of the Anvers Island ice cap. Additional measurements, made during 1965, will allow an analysis of the ice surface velocities, in terms of certain aspects of ice cap mechanics.

This program was the most heavily hindered by bad weather conditions and an estimated 81% of the possible field work time was lost. The average cloud base lies at approximately 1000 feet elevation, which leaves a great proportion of the ice cap in almost continual cloud and fog. Productivity is further hindered by the massive accumulation of snow, which reaches over 20 feet per year on the high parts of the ice cap. This demanded constant attention to the many accumulation markers placed in the ice cap surfaces.

An area of approximately 150 square miles was detailed as the study area, and some 1000 accumulation poles and over 60 ice movement stations were established. A "profile" system was employed in the study, as it was desired to obtain data representative of all the ice cap, from the coastal areas to the high interior regions.

The main drawback in the glaciology program was that it was emphatically oriented toward work on the ice cap itself and too little of the research could be conducted at or very close to Palmer Station. This could have been alleviated to some extent, if a cold room had been available. Some work was attempted in a program of ice fabric studies, after an Universal Stage had been constructed, but lack of appropriate cutting tools prevented the making of good quality ice sections and sudden rises in temperature outside, frequently halted the work. With a cold room, core analysis also could have been more successfully accomplished at the Station.

Ice Cap Operations

Working conditions on the ice cap are formidable for most of the year, and violent changes in weather are often common. On three occasions, the change was so rapid that the party involved spent an impromptu night's camping on the ice cap. One of these events did not involve storm but simply, a sudden fog. Two members of the group were taking ice cores, by drilling through the bottom of a snow pit. Their activities caused them to lose their sense of direction, and, upon realizing their predicament, they had no idea in which direction to even proceed to find the trail. They spent the night in the snow pit. Fortunately their emergency supplies were adequate, but lamentably, they were a mere one mile from the ice cap tent encampment, and furthermore, they knew it.

It was because of these violent changes that extreme caution was exercised in the very early stages, and this hindered the initial establishment of the program. It was not until the first week of April 1965 that the initial accumulation lines were satisfactorily established. Regretably, much of the good weather of January and February 1965 were used in establishing a long accumulation line, running down the entire length of Anvers Island, which, due to difficulty in servicing, was lost before one year had elapsed.

In the initial stages, a considerable amount of time was spent camping on the ice cap, but the party spent too much time just sitting in the tents while storm after storm raged outside. In early September 1965, Mr. Plummer and Mr. Randle spent 17 days camped at the northern end of Anvers Island trying to do work which really needed only two days. During one continuous 72 hour storm, a total of 96 cm of snow were laid down. It took the two men two days to return to Palmer Station, through deep, soft snow, whipped into massive sastrugi, and because of food and fuel shortage by this time,

all equipment was abandoned. They negotiated the ramp crevasse fields with the toboggans alone, in total darkness. On the beautiful morning following, Mr. Plummer and Mr. Ahrens set out to retrieve the abandoned gear, located it, but were then engulfed in another storm and spent the next two nights camping again.

After these experiences, the camping system was abandoned and the large items of camping gear were permanently stored. From this time on, light weight mountain tents were strapped to each toboggan and survival food, equipment and fuel were stuffed into the front of the vehicles. When storms seemed imminent, all personnel returned to base, and except for one occasion in May 1966, no one spent a night on the ice cap.

As a result, a system was developed whereby as much work as possible was brought from the cap to Palmer Station. Some 200 m of ice cores were brought down and stored for later study, in bad weather, and more detailed work was begun on the ramp, immediately behind Palmer Station. This proved successful except that 70 m of core were lost, when a sudden temperature rise occurred in September 1965 and ruined the samples. The same system was employed in 1966 and limited cold storage space was available in the newly acquired top-loading deep freezer.

Eventually, the first years work realized the establishment of two longitudinal lines of accumulation poles and 18 ice movement stations, before winter set in, and a later development of these in the spring and early summer, which brought the accumulation line total to some 65 miles (approximately 700 principal points), and the ice movement stations to 68 in number. Snow pit work and ice coring were successfully accomplished during the winter period. August saw the entire group camping on the ice cap.

This program was maintained during 1966 and additional work was carried out in the form of a slope survey at many of the ice movement stations, together with detailed leveling and profile operations. The ice movement stations were resurveyed during late 1966 and January 1967.

Apart from the weather, the 1966 program ran very smoothly and no major equipment break-down was experienced. The Komaris toboggans functioned almost perfectly, in often very difficult conditions, and justified the trust with which they had come to be regarded.

1966 saw a very different state of affairs. The first major setback was the loss of one toboggan, 72 feet down a crevasse. Fortunately we were able to repair this, and it operated without fail until August 2, 1966. At that time, the connecting rod in the engine broke. No spares were available and a fantastic program of "jury rigging" got under way. Eventually, the 18 hp, twin cylinder engine from the station arc welder was fitted to the vehicle chassis, and after a clutch had been manufactured, the toboggan operated unflinchingly to the end of the season. Other vehicle problems included broken track guides and frames, broken tracks, pillow-block bearing failure, and throttle assembly failures. None of these can be regarded as the manufacturer's fault. Both machines were simply worn out after over 1200 hours of operation on one vehicle and over 1600 hours on the other. Really, they should have been replaced at the end of 1965 and certainly new engines should have been fitted. It is sadly ironical that all the time lost because of vehicle failure, could have been avoided if the original requests for spare parts had been filled. The effective life of a single cylinder Kohler engine seems to be 1000 hours and it is strongly recommended that the two vehicles now at Palmer Station, be fitted with new engines at the beginning of 1968.

In view of the apparent ease with which a vehicle can be lost, it is also recommended that a toboggan be used for the Palmer Station operation.

The conclusions to be drawn from these experiences are that Palmer Station is, from the point of view of glaciological research, the most difficult United States Antarctic station to work at. Future workers should plan their programs so as to accomplish all their major ice cap field work during the period mid-December through March, when weather conditions are more favorable. The winter's program should require a minimum of time on the ice cap, and should concentrate its efforts close to Palmer Station. The 1000 fuel contour seems to be the limit for planned winter activities.

To a great extent, the present party, under the direction of Mr. R. A. Honkala, is pursuing this plan of action, and new proposals, now in preparation, take these conclusions into very serious account.

Associated Programs

As part of the general survey of the area around Palmer Station, the U. S. Naval Oceanographic Office began a hydrographic survey but was unable to complete it during the summer of 1965. The Ohio State University party undertook its completion during the winter of 1965. This gave useful employment in low overcast conditions, when ice cap work was not possible and was eventually successful by the end of the year. The results were accepted by the Oceanographic Office in January 1966.

At the request of the U. S. Geological Survey Topographic Division, celestial observations were made from a previously established British monument, located near Nessel Point in Arthur Harbor. The object of the observations was to improve the geographic position-fix for Palmer Station.

Many problems were encountered with equipment, but the weather, of course, was the major hindrance. The program was not completed by the end of 1965.

It was intended to complete the observations during 1966 but this was prevented by poor observing conditions; July was the only really good month of 1966 but coastal fog was persistent.

Many problems arose in the main work schedule, primarily vehicular troubles, and the incomplete program was finally abandoned.

The results obtained have been submitted to the U. S. Geological Survey, together with a preliminary report. A final report is pending and copies will be forwarded to the National Science Foundation.

Geology 1966 - Mr. L. E. Brown - Ohio State University

The small geological program pursued by Mr. Brown during the 1966 winter, was perhaps, the most successful and encouraging enterprise undertaken. It is regrettable that more adequate equipment and facilities were not at Mr. Brown's disposal.

His equipment included a small diamond slab saw and a lapping wheel, but due to failure in the resupply, only one electric drive was provided. This problem was solved by making a portable drive-mount, which was moved from one piece of equipment to the other.

An old storage shack was cleaned out to accommodate the equipment, and a small 1.5 kw portable generator supplied power. Mr. Peckham provided desk space in the laboratory, for microscope work.

The program was aimed at elucidating certain petrological relationships in the local geological formations, and at the end of 1966, the results looked promising. Glacial-geology was included in the overall program and will be of great direct value to the glaciological research program.

The success of this small venture points up the value of intense summer sample collecting and the utilization of winter time for indoor study. Mr. Brown is to be commended for his enthusiastic efforts to work this program, which was entirely voluntary, and which he pursued in his own time. A report is in preparation.

Station Meteorology 1965-1966 - Ohio State University

The glaciology party was responsible for the maintenance and operation of the station meteorology facility, and obtained a continuous meteorological record from February 1, 1965 through January 31, 1967. This program is being continued by Ohio State University personnel, under Mr. R. A. Honkala's direction.

The program was limited in scope and was aimed at obtaining general information about meteorological conditions in the Palmer Station area. Only surface observations were made, as the facility was not equipped for upper-air research. The basic meteorological parameters, air temperature, humidity, atmospheric pressure, wind speed and direction, cloud condition and prevailing weather, were made at three-hourly intervals from 1200Z through 0300Z (0700 through 2200 local).

As the meteorology program was subordinate to the ice cap program, times occurred when no persons were available to make a direct meteorological observation. In these cases, reliance was placed on the numerous automatic recording instruments, for compilation of the meteorological record. A summary of meteorological conditions appears in appendix 1.

Few problems were encountered, but the most frequent involved the German made Lambrecht wind recorders, which had seen extensive previous service in Greenland. Some wind record was lost due to these failures, and it is recommended that the instruments be replaced by more sophisticated equipment.

In addition to the station facility, a small program of observation was carried out at a site on the ice cap at 1000 feet elevation. This was in close connection with the general glaciological program.

This facility is open for extensive development, and in view of the imminent commissioning of the new Palmer Station installation, it is recommended that a substantial investment be made in the meteorology program. This seems justifiable in view of the fact that more extensive observations might be required in the future, resulting from the transfer operations. The possibility of increased air activity always exists, and would also call for a more intensive meteorological program. If professional equipment is installed in the first instance, it would constitute a solid foundation upon which to develop any further activities.

Visitors to Palmer Station

Of all the United States Antarctic stations, Palmer Station stands unique in its situation, in the populous Antarctic Peninsula area. This brings it into contact with a large number of visitors. Unlike other U. S. stations, Palmer Station tends to receive "spontaneous" visitors who arrive quite unexpectedly and generally, informally.

A case in point was the evening of December 30, 1965 when, at 10:30 p.m., all station personnel were in the living room, having just watched a motion picture. The night outside was foul; dark, foggy and wet. A pounding on the outside door startled everyone (to say the least). It could hardly be the dog! Chief Ferguson (brave soul) investigated, and upon opening the outside door, was confronted by the splendid, dress uniformed figure of a Chilean Naval lieutenant.

The good man's mission was simple. His Captain wished to say "Hello", and enquired as to the safety of his position-at-anchor, in Arthur Harbor. Needless to say, all personnel at Palmer Station were delighted to greet him and to answer his question, but alas, the poor lieutenant's condition, upon leaving the station was such, that he forgot to report to his Captain that night.

During the two year period, the station was visited by groups from Argentina, Chile and Great Britain, some on an official basis of inspection under Article 7 of the Antarctic Treaty, but generally the visits were of a most informal nature.

Treaty Inspections

On January 31, 1966, the Government of Argentina made a formal inspection of Palmer Station under Article 7 of the Antarctic Treaty. The inspection party arrived in the Argentine ship Bahia Aguirre, commanded by Captain Jorge A. Magnoni, Argentine Navy. In the party were Dr. Cesar A. Lisigolf, glaciologist, and Dr. Alfredo Corta, biologist, both of whom were from the Argentine Antarctic Institute, and Lt. Jg. Juan Fernando D'iscarpa, Argentine Navy. This visit lasted for approximately two hours.

A second inspection of the station was made by the Government of Great Britain and Northern Ireland on February 22, 1966. The party arrived by helicopter from HMS Protector and consisted of Captain S. Sandford RN, Commanding Officer of HMS Protector, Lt. Cdr. Woodhouse, Lt. Cdr. Johnson, Lt. Cdr. Lentine and Lt. Smith. An air-crew man was also present but did not take part in the tour of the station. Again, this visit lasted for approximately two hours.

On such occasions, the visitors were introduced to all station personnel and entertained to coffee and cakes, or other beverages if they chose. They were encouraged to ask questions about our activities and to take photographs if they wished. Many of the visitors were particularly intrigued by the fuel holding system, and particularly the methods used to fuel the station. During the British inspection we were asked if we carried fire arms and were able to answer in the negative. What looked like a geiger counter, was also carried by the British group.

These inspections were carried out in an atmosphere of great cordiality and I feel sure that the inspectors were well satisfied with our activities.

Informal Visitors

RRS John Biscoe called at Palmer Station on three occasions in 1965; on March 3, March 23 and April 4. Between the latter two dates, Mr Hugh O'Gorman, of the British Merchant Service, lived with us at Palmer Station. On final departure, the captain of the John Biscoe was good enough to carry mail out for us.

The Chilean ship Yelcho (AGS 64), comm'd by Lt. Cdr. Henrique, Armada de Chile, anchored in Arthur Harbor on the evening of December 30, 1965. A brief visit was made to the station that evening by a small shore party. The following day, all personnel from Palmer Station were entertained to lunch aboard the Yelcho, and reciprocated by throwing a highly successful new years party at the station that same evening.

Similarly, the Chilean ship Piloto Pardo, under the command of Cdr. Mario Poblete, arrived quite unexpectedly on February 1, 1966, after her helicopters had overflowed the station the previous evening. A party of five persons led by Cdr. Poblete, visited the station for a short while. The following day, all personnel from Palmer Station were lavishly entertained in the wardroom of Piloto Pardo, after which, a large number of her crew and scientific personnel visited the station.

RRS Spinkleton was our next visitor, on March 29, 1966, but no shore party visited the station. We were however, able to send mail out on this ship.

Our next visitors were again British and arrived by air. The British Antarctic Survey Otter aircraft landed on a pre-marked runway at 1000 ft. elevation on the ice cap and was tied down at a previously constructed tie-down. The three crewmen, Ft/Lt. P. Burgess I.M., Ft/Sgt. J. Coggins RAF and

Lt. P. Kay, British Merchant Service, were accommodated at Palmer Station for several days.

This activity was part of a British Logistics effort to transport material to their station on Adelaide Island, and when RRS John Biscoe arrived in Arthur Harbor on December 12, the operation was begun. All materials were off-loaded from the ship and transported by toboggan and sled to the aircraft. A shuttling operation got underway and by December 15, all materials had reached Adelaide Island. When RRS John Biscoe departed, Mr. Peckham was aboard.

Of particular interest, were the several visits made by the Argentine ship Lapataia and her tourist passengers, and which seem to herald a new dimension in Antarctic exploration. Let it be recorded, that personal feelings notwithstanding, concerning the invasion of ladies-of-adventure into what should remain strictly a man's domain, the advent of this new era was more successful and much less painful than this writer had anticipated.

The first arrival of Lapataia on January 26, 1966, did give cause for mild alarm, basically generated by the lack of communication with the captain of Lapataia and her cruise director. Sea ice conditions prevented small boat travel between the ship and Palmer Station, and as all available aircraft were in other service, no contact could be made. Large numbers of tourists visited Litchfield Island, with apparent disregard for the possibility that the island might have been under intense study. Fortunately this was not the case and no damage seems to have been done to the rich fauna and flora of this island.

Direct contact was made on the two visits of Lapataia in 1967 when the ship arrived in Arthur Harbor on January 13 and February 8. Large numbers of

tourists were able to visit the station site and were given concise tours of the local area. It became quickly apparent that this was a pleasurable experience. Many of these people showed intense interest in our activities and I believe, departed with a favorable impression. Many of them represented the various news media, of national repute, and it would be interesting to read the fruits of their research. Our humble hospitality was generously returned and on both occasions, personnel from Palmer Station and from the supporting ships were lavishly entertained in the saloon, aboard Lauda. In retrospect, and personal feelings aside, I see no cause for alarm in these tours, provided that the cruise directors are made fully aware of the sanctity of research study areas and that everyone concerned is familiar with the conservation clauses in the Antarctic Treaty.

Sea Ice Conditions in the Palmer Station Area

Generally, Arthur Harbor is easily accessible between December and March, and is closed between April and November. Summer conditions are generally of floating light pack and ice trash with occasional bergs. In winter, drifting heavy pack with large flows or locally formed fast ice occur. Overall, the sea condition can prevent small boat operations at any time of the year. A small ocean-going vessel would experience extreme difficulty during the winter and on infrequent occasions in the summer. It would appear possible for an ice breaker of the Wind class, to approach Arthur Harbor, with some difficulty, at any time of the year.

During 1965, the sea in and around Arthur Harbor, did not freeze locally to form fast sea ice. Heavy pack drifted into the area from the south and south-west and froze in situ. Occasional breakup of this ice mass allowed limited small boat operations in Arthur Harbor, and was never strong enough for travel on foot.

During 1966, local fast ice formed. It reached a maximum measured thickness of 46 cm and was strong enough for extensive travel on foot. Breakup of this ice was not experienced during the winter period, and it finally broke up in late December. RRS John Biscoe attempted to ram her way into the harbor on December 12 and made only 100 yards before abandoning the effort.

Air Operations in the Palmer Station Region

There is no indication that planned air operations for the Palmer Station activity, with aircraft deployed from South America or Antarctic continental stations, are feasible. Large aircraft could safely and easily operate from the surface of the Anvers Island ice cap for most of the year at elevations above the 1000 ft. contour. In summer, due to soft surface conditions, the operation of aircraft larger than a C-47 would be restricted to higher elevations.

If an aircraft had to deploy to Palmer Station, there is every possibility that it would have to stand at its point of departure for as much as three weeks before visibility conditions at Anvers Island would permit a landing. The violent changeability of the weather could well result in many aborted missions. The difficulties encountered by the U. S. Navy's C-121 in August and November 1966, demonstrate these facts most significantly. During 1965, landings would have been possible on 99 days, and during 1966 landings would have been possible on 84 days. No single month can be relied upon for planned operations.

That small aircraft can operate from the Anvers Island ice cap, was demonstrated by the highly successful activities of the British Antarctic Survey in December 1966. This leads to the conclusion that if Anvers Island based operations are ever desirable, they would be feasible. Logistics problems would however be encountered, due mainly to the very high snow fall, and would necessitate a totally mobile system and would prevent the long term use of conventional air-ops installations.

Concluding Remarks

The Antarctic has been variously described, and arising from this is the fact that the Antarctic, with its treaty protection, emerges among other things, as a vast area of international cooperation. This makes every Antarctic station an Embassy, and each of its occupants an Ambassador. The creation of good will and a good impression are therefore, of major concern.

The United States, often regarded as the economic and political leader of the world, and the power which has set the standard by which most of the world would wish to live, carries the consequences of this, even into the Antarctic. Many of our stations and facilities are excellent evidence of our enthusiasm for honest scientific research and of the sincerity of our endeavors in Antarctica. They present the picture as others would wish and expect to see it. At Palmer Station, I feel that in some respects, we failed ourselves by presenting a print instead of the original.

The geographical location of Palmer Station sets it aside from other U. S. facilities and because of its isolation from the main body of U. S. Antarctic activities, imposes upon it a greater burden of self reliance than any other U. S. station. Throughout this report, I have tried to emphasize the significance of what others think of us and I often wonder what they really thought. Did Palmer Station, as a modern research facility, really come up to their expectations? We stand a second judgement when the scientific community presents the results of its endeavors. However, I am well satisfied, that the personnel of Palmer Station, both military and civilian, did credit to their cause, in all its phases, and that during 1965 and 1966, Palmer Station was a success.

The imminent commissioning of the new, and perhaps more efficient, efficient installation, the advent of trawler based marine research and the general build up of activity in the area, will spotlight U. S. Antarctic effort yet again. It calls for the ultimate in planning operations and in concern for and attention to, the Alford agenda. Palmer Station is, I believe, the most important activity operating in Antarctica, under the flag of the United States of America.

ANNEX 1

Summary of Meteorological Conditions

Year 1965

AVERAGE AIR TEMPERATURE IN DEGREES FAHRENHEIT

FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
35.3	35.7	29.0	27.5	23.5	16.7	13.1	24.8	18.1	30.0	31.8

NUMBER OF DAYS WITH RAIN & DRIZZLE/FREEZING RAIN & DRIZZLE

FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
6	16	1	5	3	1	0	5	0	6	5

NUMBER OF DAYS WITH SNOW & SLEET

FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	10	17	15	20	13	8	22	18	15	16

AVERAGE CLOUD COVER BY TENTHS

FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
8.61	7.96	8.28	7.79	8.14	7.17	4.36	8.26	8.48	9.29	6.41

AVERAGE WIND SPEED IN KNOTS

FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
4.9	8.0	7.2	5.9	9.3	4.0	2.1	10.5	6.6	6.4	5.6

PEAK GUSTS IN KNOTS

FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
42	46	42	45	46	45	46	55	47	45	45
N	N	N	NNW	E	NNW	NNE	NNW	E	NNE	NNE

SUMMARY OF WEATHER DATA, GREENSBORO

Year 1965

AVERAGE AIR TEMPERATURE BY DECADE PAIR ADULT

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
35.5	32.9	32.0	27.9	24.3	21.1	27.2	34.7	42.5	48.9	45.6	32.0

NUMBER OF DAYS WITH RAIN & DRIZZLE/FROEZING RAIN & DRIZZLE

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
3	3	9	13	1	2	1	1	1	1	4	2

NUMBER OF DAYS WITH SNOW AND SLEET

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	2	20	15	14	17	13	20	17	24	16	15

AVERAGE CLOUD COVER BY TENTHS

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
8.10	7.03	9.07	8.44	7.83	6.17	7.65	7.97	8.36	9.10	8.59	8.13

AVERAGE WIND SPEED IN KNOTS

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5.4	3.6	5.5	7.0	7.3	9.8	6.3	8.8	7.7	6.5	4.6	3.6

PEAK GUSTS IN KNOTS

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
25	*	40	50	40	50+	50	60	60+	40	25	40
ESE	*	NE	ENE	ESE	ENE	N	ENE	ENE	NW	ESE	ENE

APPENDIX 2

Michigan Personnel

1965

T. A. Adkins CSC USN
W. F. Amstutz USARP
C. S. Asworthy HMC USN (Chief Petty Officer in Charge)
J. C. Cummings HMC USN
C. L. Ferguson CEC USN
G. A. Lippert USARP
C. C. Plummer USARP
A. S. Rundle USARP (Station Scientific Leader)
J. L. Strong USARP

1966

L. E. Brown USARP
S. R. DeWitt USARP
P. L. March CSI USN
V. L. Nance RML USN
V. Peckham USARP
A. S. Rundle USARP (Station Scientific Leader)
D. J. Skelly HMC USN (Chief Petty Officer in Charge)
R. J. Wrigley EOC USN