ANTARCTIC TREATY INSPECTIONS 2005

Report of Antarctic Treaty Inspections undertaken jointly by the United Kingdom, Australia and Perú in accordance with Article VII of the Antarctic Treaty and Article 14 of the Environmental Protocol.

Foreign and Commonwealth Office, London, UK
Australian Antarctic Division, Kingston, Tasmania, Australia
Instituto Antártico Peruano, Lima, Peru

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Cover picture: View of the Osterrieth Range, Gerlache Strait

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Introduction

Inspections were conducted jointly during February and March, 2005 by the United Kingdom, Australia and Peru in the Antarctic Peninsula region.

The Inspections were undertaken by Observers designated by their respective governments in accordance with the notification procedures of Article VII (1) of the Antarctic Treaty.

Observers so designated were:

For the United Kingdom:

- Dr. M.G. Richardson (MR), Head of the Polar Regions Unit, Foreign and Commonwealth Office, London.

- Mr. R.H. Downie (RD), Environmental Manager, British Antarctic Survey, Cambridge.

For Australia:

- Mr. T. R. Maggs (TM), Environmental Manager, Australian Antarctic Division, Kingston, Tasmania.

For Peru:

- Mr. J.C. Rivera (JR), Environmental Officer, Instituto Antártico Peruano.

The logistic platform for the Inspection Programme was provided by the United Kingdom's Ice Patrol Vessel HMS *Endurance*. Most Inspections were made using the ship's two *Lynx* helicopters, with a few exceptions which were made by small boat. Helicopter support allowed for flexible and speedy logistics without which far fewer Inspections would have been possible in the time available.

The core Inspection Team consisted of Richardson, Downie, Maggs and Rivera. In addition, some Inspections were augmented, on a rotational basis, by Officers from HMS *Endurance* who had also been designated as Observers through diplomatic channels. The identity of the core Observers involved in particular Inspections is indicated at the end of each report by their initials.

The Inspection Team on the flight deck of HMS Endurance *with a RN Lynx Helicopter. From left to right: Tom Maggs, Rod Downie, Mike Richardson, Lt Simon Collins, RN, Lt Mark Jameson, RN, Juan Carlos Rivera.*

The Inspections, undertaken between 10 February and 9 March, consisted of nine permanent (year-round) stations, five summer-only stations, three unoccupied stations, one station under construction, five Historic Sites and Monuments and one tourist vessel. In addition, five further unoccupied stations were overflown by helicopter but not actually visited. This was due to the large numbers of penguins or Fur Seals present in and around the stations concerned - landing a helicopter in the vicinity would have caused unacceptable disturbance to wildlife and would have been in contravention of Annex II to the Environmental Protocol. Stations which were unoccupied at the time of visits are dealt with separately in this Report.

In total, the stations or facilities of 13 Consultative Parties and one non-Consultative Party were inspected during this programme.

Brief visits were also made to the non-governmental 'Eco-Nelson' on Nelson Island, South Shetland Islands, and the Australian-flagged yacht *Australis* whilst at anchor in Port Lockroy. Comments on these visits are included within this Report. Because of their brief duration and informal nature these visits should not be considered as Inspections.

To ensure impartiality, UK-designated Observers did not take part in the Inspections of operational UK stations or Historic Site and Monument No. 61 ('Base A', Port Lockroy), nor in the writing of the respective Inspection Reports. UK-designated Observers were however involved in the Inspections of unmanned Historic Sites and Monuments No. 62 ('Base F', (Wordie House), Argentine Islands), No. 63 ('Base Y' Horseshoe Island) and

No. 64 (‘Base E’, Stonington Island).
All Inspections were undertaken in accordance with Article VII of the Antarctic Treaty and Article 14 of the Environmental Protocol.

In line with Article 14(4) of the Protocol, reports of all Inspections undertaken were forwarded to the Treaty Parties concerned for comment. Where responses from Parties were of a minor drafting nature the proposed changes were incorporated in the relevant report. Responses of a more substantial nature are included within this report at Appendix 1. The report of the Inspection of the tourist vessel was also sent to the respective tourist operator and IAATO as well as the flag-State.

Itinerary

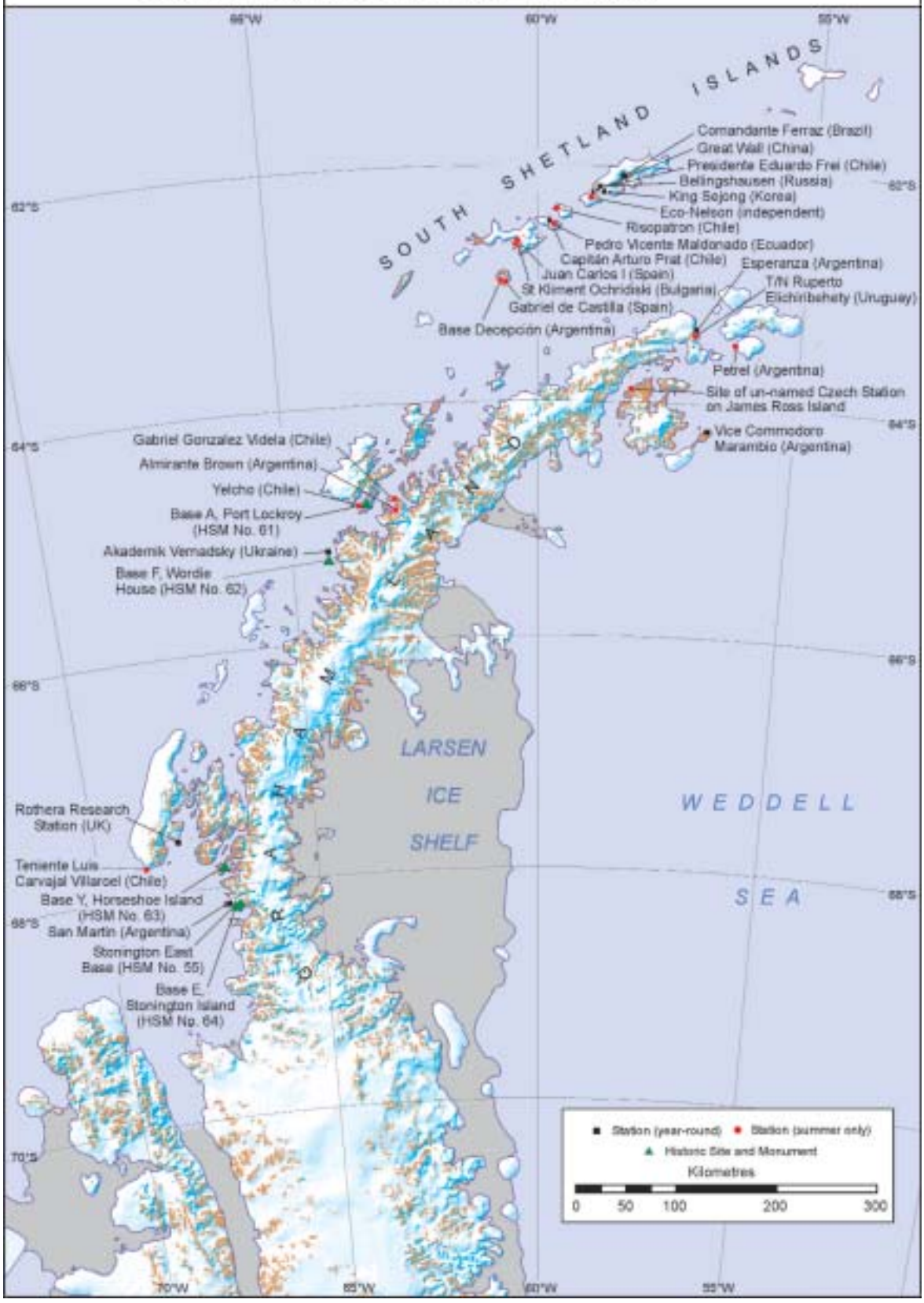
HMS *Endurance* departed Mare Harbour, Falkland Islands on 8 February. Thereafter, the dates of Inspections were:

Date (2005)	Station/facility/vessel	Country	Status[1]
10 February	Comandante Ferraz	Brazil	P
11 February	Esperanza	Argentina	P
11 February	T/N Ruperto Elichiribehety	Uruguay	UO
14 February	King Sejong	Republic of Korea	P
15 February	Great Wall	Peoples Republic of China	P
16 February	Bellingshausen	Russian Federation	P
	'Eco-Nelson'	Non-governmental	
17 February	Capitán Arturo Prat	Chile	UO
	Pedro Vicente Maldonado	Ecuador	UO
	Risopatron	Chile	UO
20 February	Gabriel de Castilla	Spain	SO
	Base Decepción	Argentina	SO
21 February	Juan Carlos I	Spain	SO
	St. Kliment Ochridiski	Bulgaria	SO
25 February	Petrel	Argentina	SO
	Vice Comodoro Marambio	Argentina	P
26 February	Unnamed Czech Station, James Ross Island	Czech Republic	UC
27 February	MV *Professor Molchanov*	Russian Ferderation	V
28 February	Yelcho	Chile	UO
	Almirante Brown	Argentina	UO
	Gabriel Gonzalez Videla	Chile	UO
	Base A, Port Lockroy	UK	HSM
1 March	Akademik Vernadsky	Ukraine	P
	'Base F' (Wordie House) Winter Island	UK	HSM
3 March	Teniente Luis Carvajal Villaroel	Chile	UO
	San Martin	Argentina	P
	'Base E', Stonington	UK	HSM
	Stonington- East Base	USA	HSM
4 March	'Base Y', Horseshoe Island	UK	HSM
5 March	Rothera Research Station	UK	P

[1] Key:

P	Permanent (year-round) station
SO	Summer-only station
UO	Unoccupied station
UC	Station under construction
HSM	Historic Site and Monument
V	Vessel

Figure 1 - Stations and Historic Sites and Monuments inspected or visited by the joint Antarctic Treaty Inspection Team (Feb - March 2005)



All Inspections were undertaken using the Inspection Checklists adopted by the Antarctic Treaty Consultative Meeting, viz:

> Checklist "A" for permanent and summer-only stations (agreed in 1994, ATCM XVIII)
> Checklist "B" for vessels within the Antarctic Treaty Area, and
> Checklist "C" for abandoned stations and associated installations.

These checklists were adopted through Resolution 5 (1995) at ATCM XIX.

The checklists were used as an *aide-memoire* whilst undertaking Inspections rather than as exhaustive questionnaires. However, to ensure that the information collected on each station was recorded in a consistent fashion, a definitive checklist was completed immediately following each Inspection using the notes compiled by each Observer. These completed checklists have been retained for archival purposes.

Prior to undertaking any Inspections, the credentials of the designated Observers were shown to the Station Leader (or in the case of the vessel inspected to the Expedition Leader and Master), and copies of such designations were provided.

The Inspection Team was based onboard HMS *Endurance* throughout the duration of the programme, and disembarked at the UK's Rothera Research Station on 4 March. From there the Team flew back direct to Punta Arenas, Chile on 8 March.

ACKNOWLEDGMENTS

Without exception, the Inspection Team was afforded unlimited access to all facilities of each station and the Team would like to extend its sincere gratitude to the Station Leaders and staff who provided invaluable assistance and very generous hospitality – often at short notice.

These Inspections would not have been possible without the great support provided by the Commanding Officer (Captain T. Karsten RN), Officers and crew of HMS *Endurance*. In particular the Flight Crew of the vessel's two *Lynx* helicopters spent many hours, often in adverse weather conditions, safely transporting the Observers to the numerous Inspection locations.

GENERAL REMARKS AND CONCLUSIONS

At the end of each station or facility report we have, as appropriate, set down recommendations specific to that site. In addition to those recommendations, more general points, common to a number of, or many, stations are set out below as follows:

- **Scientific Research**:

  Although some stations were undertaking world-class scientific research into a wide variety of disciplines (though many geared to climate change), a larger number of stations appeared to have relatively modest, or even rudimentary, science facilities. This was particularly so when viewed against the substantial size of some stations' infrastructure. In many situations science programmes appeared to consist of no more than routine data observations involving technicians collecting e.g. meteorological, or tidal measurements. In consequence, stations in close proximity to each other were often collecting similar data on the same parameters.

  The Inspection Team believe, in the circumstances, that there would be virtue in SCAR undertaking an audit of science being carried out in Antarctica. Such an assessment might examine issues in-situ such as science priorities, duplication of data collection, as well as identification of areas of scientific research which need to be strengthened.

- **Scientific Co-operation**:

  The Team found relatively little co-operation on science between stations, even including those sited in close proximity. Even where they co-operated logistically or interacted socially there appeared to be a lack of scientific dialogue between adjacent stations. This seemed particularly so on King George Island (Maxwell and Admiralty Bays). Furthermore, given the significant cost of establishing and running a scientific station in Antarctica, it was not clear to the Team why greater consideration had not been given by some new entrants to the Antarctic Treaty System to share resources and thereby ensure that joint operations would produce a more cost-effective delivery of science and a significantly smaller human footprint.

- **Abandoned/Unoccupied Stations**:

  During the course of this Inspection Programme, a significant proportion (25%) of stations (previously recorded as either permanent or summer-only) were unoccupied. It was not apparent to the Inspection Team whether any of these stations had been occupied earlier in the 2004/05 summer season. In most situations it appeared however as though the facilities had not been utilised, at least for the past two-five years, or longer in some cases. Yet some of the facilities visited or overflown were clearly in a sound state of repair and capable of being utilised. Others however had suffered storm damage.

At a time when further stations are currently under construction or being proposed, some form of rationalisation of facilities in Antarctica ought to be considered. Parties which own abandoned or unoccupied stations should determine whether they intend to re-occupy stations (as science facilities) in which case refurbishment, perhaps extensive, might be required. Alternatively those Parties should consider other options for these stations. These might include their:

- removal/remediation as required by Article 1 (5) of Annex III to the Environmental Protocol;

- formal transfer or lease to another Antarctic Treaty Party; or

- conservation, maintenance and designation as an Historic Site and Monument, if appropriate.

- **Fuel Storage and Transfer**

Inadequate standards of fuel storage and transfer continue to be the main environmental concern at most stations inspected by the Team. This had also been the case in the UK/Germany 1999 Inspection, as well as in the Norwegian Inspection Report of 2001 and the Finnish Inspection Report of 2004 in other sectors of Antarctica. A large fuel spill on land is considered to be one of the greatest local environmental threats.

Fuel transfer was noted to be undertaken by a number of means, including ship-to-shore fixed or floating pipeline, fuel barge, 205 litre drums, or delivery by helicopter in underslung tanks. At some stations, fuel is transferred up to 5 times from the resupply vessel to its final destination in power generation. Whilst fuel transfer was not witnessed at any of the stations during the Inspection, only a few of the stations inspected were able to produce documented transfer procedures.

Eleven of the 14 occupied stations inspected had bulk fuel storage facilities. Of these, 7 (64 %) had no effective secondary containment (i.e. sufficient to contain the full capacity of the largest tank within a fuel farm). This included some tanks of up to 250,000 litres capacity. Some examples were also noted of attempted but ineffective or inadequate secondary containment (e.g. bunding around the tank valves only, or unsealed or poorly maintained bunds to the point where in the event of a spill they would serve no purpose).

At least three of the stations inspected had no formal Oil Spill Contingency Plan. Those same three operators provided no formal oil spill training or exercises for their staff.

Poor maintenance of tanks and transfer equipment was also evident at some stations. Tanks and tank foundations were at times noted to be heavily corroded and in some cases actually leaking fuel. Only one of the stations inspected had formally audited its fuel storage and transfer procedures and equipment, and containment and response capability, against COMNAP's recommended checklists.

An example of badly corroded and leaking bulk fuel tanks set on severely eroded foundations

Ground contaminated with fuel oil was noted at a few of the stations inspected – at one station in particular, the Team were concerned to note extensive areas of soil saturated with diesel.

- **Environmental Impact Assessment Procedures**

Most stations visited were aware of the requirement for Environmental Impact Assessment (EIA) for new buildings or projects. However, the majority were unable to provide examples of recently prepared EIAs. Whilst in most cases the responsibility for undertaking such assessments lies with the environmental sections, Governmental Departments or Ministries based back in the relevant country, neverthe less the Team was disappointed to note little evidence of the EIA process at the stations themselves.

- **Protection of Flora and Fauna**

The protection of flora and fauna was accorded a high priority at most stations. Poster displays with guidelines, generally based upon Recommendation XVIII –1, were prevalent. At some stations, densely vegetated areas, or penguin colonies were roped off to prevent disturbance.

Most stations were aware of the regulations governing the introduction of non-native species. However, at one station, untreated timber had been used in recent construction activities, and introduced houseplants and soil were noted. Only a few examples of measures being taken to prevent the accidental introduction of non-native species were reported to the Inspection Team.

- **Area Protection and Management**

  Given the comments from the 1999 Inspection Report (UK/Germany) concerning the concentration of facilities in Maxwell Bay and their cumulative impact on that part of King George Island, the Team welcomed the news that initial consultations and baseline surveys are underway with the aim of proposing the Fildes Peninsula as an Antarctic Specially Managed Area.

  However, the Team was disappointed to hear of the apparent lack of co-ordination amongst those Parties with stations located within Admiralty Bay (which is subject to a voluntarily adopted ASMA Management Plan). The Team understood that little progress had yet been made to formalise the Admiralty Bay ASMA, voluntarily adopted at ATCM XX (Utrecht, 1996)

- **Environmental Monitoring**

  Monitoring the impact of station activities varied greatly. Most commonly, the volume and type of waste produced was monitored and reported upon. Chemical and biological monitoring of sewage effluent and water quality (sometimes at considerable detail) was undertaken at a number of stations, particularly those operating sewage treatment plants. The impact of air operations on nesting birds was carried out at two stations, and studies into scavenging by avian populations was undertaken at one. Floristic survey and vegetation mapping was also undertaken.

  Overall, it was apparent to the Team that there was no consistent or focused approach to monitoring in terms of agreed protocols, which parameters should be monitored, and to what level of detail.

  The Team were aware of the considerable work currently being undertaken by SCAR, COMNAP and the CEP to assess monitoring needs and methodologies, and hoped that this would provide the necessary guidance to Parties.

- **Tourism**

  The degree of tourism activities at stations varied considerably. A few stations actively encouraged visits from tourist vessels; most accepted, though then controlled, the number of such visits each season; whilst some stations actively discouraged or refused access to tour operators. On the whole, the Team gained the impression that the relationship between tourist and state operators appeared satisfactory. Only one Party expressed the view to the Inspection Team that tourism had created difficulties, and was incompatible with scientific research in Antarctica.

  Irrespective of the degree to which Parties' stations engage with tourist operators, the Team saw virtue in Parties setting out and making publicly available their respective policies on tourism for each of their Antarctic stations. Such transparency would assist others, including IAATO, in conducting tourism activities in a manner compatible with the stated views of Treaty Parties.

- **Non-Governmental Facilities**

  The Inspection Team's visit to "Eco-Nelson" on Nelson Island raises an important issue. Whilst this modest facility undoubtedly has minimal environmental impact (indeed it had been established to demonstrate minimalist survival in harsh climatic extremes) nevertheless, this operation is the only non-Governmental permanent facility in Antarctica. It raises the broader question as to whether the precedent set by such un-regulated activities are now compatible with the objectives of the Environmental Protocol. The scope of Parties' responsibilities and control over their nationals' activities in the Antarctic is an issue that warrants further consideration. Otherwise, there is the potential for such uncontrolled activities, including the construction of further land-based facilities, to proliferate.

- **Inspection Documentation**

  Information provided to the Inspection Team varied considerably, even between different stations operated by the same Party. In some situations, comprehensive documentation had been prepared. The most useful, in the view of the Team, was where six stations had provided completed versions of the Checklist adopted by the ATCM for permanent stations (Checklist A). Given the tight timeframes under which most Inspections were carried out due to logistic constraints, this proved to be invaluable in focusing the Inspection. The Team was of the view that the production of standardised reports for Antarctic stations in the format of Inspection checklists should be undertaken as a requirement. This issue should be addressed by the ATCM and COMNAP.

MAJOR RECOMMENDATIONS (these are not placed in any particular priority order)

- That Parties, particularly those whose stations in Antarctica are in close proximity, should ensure that they liaise and co-operate on scientific research, as appropriate, to ensure that duplication of science is minimised, and scientific priorities are addressed in the most effective manner;

- That SCAR, in furtherance of the above, should consider undertaking an in-situ audit of scientific research in Antarctica;

- That the construction of stations at previously unoccupied sites in Antarctica should be minimised. The location of any such new sites should be selected with a view to optimising science, whilst minimising environmental impact, and in accordance with the principles of Articles 3 and 6 of the Environmental Protocol;

- That Parties, particularly those that have relatively recently acquired status within the Antarctic Treaty System, should consider joint operations in Antarctica, thereby: (a) minimising the environmental impact of constructing new facilities, and (b) creating more effective joint science and logistic arrangements;

- That Parties should prepare detailed reports on their stations and other facilities in Antarctica. Such reports should be in the format of the Inspection Checklists adopted by the ATCM, reviewed and updated regularly, and placed on the website of both the Antarctic Treaty Secretariat and COMNAP;

- That Parties should prepare, and make publicly available, Policy Statements on tourism in relation to their Antarctic stations;

- That bulk fuel facilities currently lacking secondary containment should be replaced either with double-skinned tanks, or provided with adequate bunding;

- That those Parties that have yet to prepare Oil Spill Contingency Plans should do so, as required under Article 15 of the Environmental Protocol, and ATCM Resolution 1 (1997) and Resolution 6 (1998). Such plans should be prepared in association with the provision of adequate oil-spill response equipment, training and exercises.

- Furthermore, that COMNAP should consider undertaking further, up-to date assessment of fuel handling and storage facilities and procedures in Antarctica, and issue a set of clear recommendations to operators.

Some examples of Best Practice seen during the course of the Inspection Programme

Issue		**Station**
Fuel management and storage	S	Gabriel de Castilla
	L	San Martin Rothera Research Station
Power Generation	M	Great Wall
Alternative energy provision	S S	St Kliment Ochridiski Juan Carlos I Gabriel de Castilla
Science Facilities	M L	King Sejong Rothera Research Station
Sewage Treatment	L	Rothera Research Station
Waste Management	L L L	San Martin Vice Comodoro Marambio Rothera Research Station
Inspection Documentation	S	Juan Carlos I
	L L	Esperanza Rothera Research Station
Local Environmental Management	M	Comandante Ferraz
Helicopter Landing Facilities	M	Comandante Ferraz
Environmental Accreditation	S L	Gabriel de Castilla Vice Comodoro Marambio
Fire detection and suppression	L S	Rothera Research Station Juan Carlos I
Historic Site Management		Port Lockroy, HSM No. 61
SAR Capabilities		Vice Comodoro Marambio } by aircraft Rothera Research Station } by aircraft and boat

S - small }
M - medium } Stations
L - large }

VICE COMODORO MARAMBIO STATION (ARGENTINA): Inspected 25 February, 2005

Introduction

Marambio is one of the largest year-round stations in the Antarctic Peninsula region. It is situated on the flat plateau summit (height around 200m) of Seymour Island south of Antarctic Sound, on the NE of the Antarctic Peninsula at Lat. 64° 14'S; Long. 56° 37'W.

The station was first occupied in 1969 and has been considerably expanded since.

Marambio is principally a logistic station providing air support for other Argentine bases in the area. It is operated by the Argentine Air Force. Some observatory functions including ozone monitoring and meteorology are undertaken.

The operation of Marambio is the responsibility of the Dirección Nacional del Antártico (DNA) which is answerable to the Ministry of Foreign Affairs. Advice on environmental management is provided by the DNA. Science is co-ordinated by the Instituto Antártico Argentino.

Marambio has been inspected infrequently due largely to its relative inaccessibility. The most recent inspection was in 1988 by Russia and prior to that by the USA in 1983.

The main building complex at Marambio Station

Physical Description

A large, well dispersed station, Marambio consist of 22 buildings spread over an extensive area towards the northern end of Seymour Island.

Because of its elevated position, the station experiences harsh conditions and is frequently cloud covered. The ground surface consists of some 45 centimetres of very fine clay-like wet soil overlying permafrost. There is active frost heave and most of the buildings are elevated on steel supporting piles driven into the permafrost, rather than on footings. The piles incorporate flanged baffles to minimise heat transfer from the buildings melting the permafrost, which could destabilise the buildings.

The well-separated buildings and facilities are provided with interconnecting elevated walkways, decked with extruded aluminium panels and provided with hand rails. Pipework and electrical wires are supported beneath these walkways.

The largest building complex consists of a number of parallel buildings constructed at different times, and connected by a corridor. This complex houses the administration and accommodation centre of the station, as well as the meteorological and communications offices, a well equipped library and conference facilities, the restaurant, kitchen and food storage deep freezes, and a recreation area and gym. A further building in this complex was under construction to provide a 80,000 litre water tank for fire-fighting purposes.

Other buildings include a large garage for the substantial earth moving machinery, carpentry and metal workshop, large aircraft hangar, powerhouse, sewage treatment building, chapel, snow melter, ozone observatory, food store, emergency accommodation, aircraft passenger terminal, and an emergency services building.

Marambio has one of only three gravel runaways in the Antarctic Peninsula area, the others being at Rothera Research Station (UK) and Teniente Marsh (Chile).

Adjacent to the runaway is a further building comprising the aircraft control tower, a cargo terminal and a second food store. This store, plus a small museum and an adjacent snow store, are original buildings constructed in 1969-1970.

All of the buildings, irrespective of age, were in a good state of repair and painted red. Interestingly, some buildings were constructed within a robust framework of lattice girders. This external bracing provides much of the structural strength necessary to cope with the high winds frequently experienced at Marambio.

Another interesting feature common to many of the buildings was the extensive use of interlocking panels of double-layer metal sheet for flooring, similar to that used on the walkways. These floors provided highly durable load-bearing surfaces, for example in the workshop and emergency vehicle garage.

Detail of the permafrost piles supporting the building.

Elevated walkways which join all the station's buildings.

The compacted permafrost runaway at Marambio trends SW-NE, and at 1,200 by 40 metres is designed for use by *Hercules* C-130 aircraft. A shorter N-S emergency runway some 400 by 28 metres adjoins the main runway at the south-western end.

The station has a system of vehicle tracks, with a metal ramp over service ducts where they intersect.

An aspect of note is that the active erosion of the steep slopes of Seymour Island is encroaching on the building precincts, in particular near the dining room and recreation room. In places the plateau edge is now only 10-15 m from the building. Further erosion may well jeopardise the stability of this, and other buildings.

Personnel

At the time of the Inspection more than 100 personnel were present, mostly members of the Argentine Air Force, and summer-only crew or transients. This number was due to decrease to 36 on 3 March, when the Argentine naval icebreaker *ARA Almirante Irízar* was due to arrive.

Specialist staff are recruited from within the Airforce by its Antarctic Section for a five-year period. These receive additional specialist training and provide weather observation and forecasting services, communications, IT and engineering support. At the time of the Inspection, six meteorologists were present on the station.

Scientific Research

Marambio is primarily a logistics support station serving other Argentine stations in the northern sector of the Peninsula. The station itself does not undertake scientific research, and hence no laboratories are present. The station does however support various physical observatory projects, including meteorological and ozone measurements.

An observatory building houses a Dobson spectrometer and digisonde balloon launching facility. Ozone readings are taken half-hourly in spring when the sky is clear. Helium-filled balloons are launched three times per month from January to August, and twice weekly from September to December, when ozone concentrations are particularly low. A sunphotometer measuring direct solar radiation installed by Finland is located on the roof of the ozone observatory. This provides aerosol optical data for comparison with a similar observatory in Helsinki.

Safety and Training

Airforce staff destined for Marambio receive three to four months training in Argentina prior to deployment. This includes training in first-aid, environmental management, and fire-fighting. Military specialists on the station receive additional two months training in aspects such as waste management, water purification, sewage treatment and power generation.

The medical facilities were not seen during the Inspection, but the Team was informed that they consisted of an infirmary with facilities for stabilisation, X-ray, and basic dental equipment. A doctor and paramedic were resident throughout the year. Serious cases would be evacuated to Argentina by C-130. The station's aircraft facilities provide SAR and medical evacuation for other Argentine stations.

Extensive fire-fighting equipment was held on the station. A new *Oshkosh* 9-person airport fire-fighting vehicle was housed close to the runway in a dedicated emergency building. This vehicle attends all aircraft movements. It is able to deliver 500kg of foam, 150kg of dry powder, and 1780 litres of foam, and is also the station's main domestic fire-fighting resource. An ambulance was also housed in the emergency building.

Smoke detectors were installed throughout the station and networked to a central console. Numerous fire extinguishers were also provided in each building, including two large, wheeled dry-powder bottles in the workshop. Fire extinguishers were replaced regularly, and around 70 were awaiting shipment in the cargo terminal. Fire training was provided prior to deployment. Regular fire drills were held.

Transport and Communications

Marambio is well served by the vehicles and plant necessary to maintain station and aviation infrastructure, in particular the gravel runway, taxiways and aircraft parking areas. Major heavy plant included a grader, two articulated loaders, two bulldozers, and one articulated forklift. Plans are in hand to standardise heavy plant with one major manufacturer in order to minimise specialist training and spare parts holding.

Aircraft operations are supported by an *Oshkosh* fire-fighting truck. It is supplemented by a troop-configured truck, a Land Rover, and an ambulance. The station also holds at least one snowmobile.

One inflatable rubber boat is kept on the shoreline to the east of the station, an hour's walk over difficult terrain.

One fixed-wing aircraft, a DHC-6 *Twin Otter* is based at Marambio year round, flying to other stations and field sites in the region.

The station also has two Bell 212 *Jet Ranger* helicopters during the summer. These are transported to and from Rio Gallegos, Argentina by C-130 Hercules. The helicopters are used for short-range flights and to support the resupply vessel *ARA Almirante Irízar* and its *Sea King* helicopters.

The Marambio airfield has an ICAO certified instrument approach documentation.

The station is well served by satellite, HF, VHF and UHF communications. Three satellite dishes adjacent to the hangar provide 24-hour telephone, broadband internet and television connection through Argentina to the global network. Extensive meteorological information is also received and disseminated by satellite. Data from local surface observations are combined with data from some 25 other met stations, input to the WMO network, and used to prepare regular weather forecasts, principally in support of aviation.

A local-area computer network connects all major buildings, and several free public internet terminals are available. Marambio has an extensive library of operational and educational documents, photographs and maps on an Intranet server, much of which is also publicly available on the Web.

The station has the ability to hold video conferencing with offices outside Antarctica, and is developing this facility to source remote medical advice to support medical procedures in real time.

HF transmitters broadcast meteorological information on a routine schedule, and are used as a back-up to satellite communication with other Antarctic stations.

Logistics

The main station resupply routinely occurs in March, from the *ARA Almirante Irízar*. This includes the delivery of the station's bulk fuel. The *Irízar* also visits Marambio on an ad hoc basis throughout the summer.

A C-130 *Hercules* flies staff, supplies and equipment from Rio Gallegos to Marambio monthly from April to November, and every two weeks from December to March. The flight takes 3.5 hours one way.

Aircraft fuel, petrol, bottled gas and lubricants are delivered from the resupply ship by *Sea King* helicopter in 205 litre drums direct to the holding storage area 100 m west of the powerhouse.

Powerhouse fuel (diesel – Gas Oil Antarctic) is flown from the resupply ship by helicopter in rubber rolling transit tanks of 1,800 and 1,200 litres capacity. These are landed on a raised deck adjacent to the bulk fuel tanks, and gravity fed to them through mobile rubber and fixed steel pipes. Bulk fuel resupply takes seven days, flying from 3 a.m. to 7 p.m.

The bulk fuel farm consists of 32 x 20,000 litre single-skinned (10mm thick) steel tanks close to the powerhouse, and connected by a 100mm steel pipe manifold with stainless steel valves. A 20,000 litre header tank next to the powerhouse feeds a 500 litre holding tank inside the building. From here, fuel is filtered and pumped into the generator fuel tanks. None of the external bulk tanks are bunded.

Three Caterpillar generators, of 500, 600, and 700 kW, supply the station's electrical energy. Heating to the main buildings is provided by boilers and "*Thermobloc*" heaters, fuelled by diesel (GOA). This is delivered to 20,000 litre holding tanks adjacent to these buildings by a bowser truck. The station consumes an average of 722,490 litres of diesel per year.

The kitchen is fuelled by LPG (propane) in cylinders of approximately 60kg. Annual consumption was not determined.

Jet A-1 fuel for turbine-engine aircraft is held in 205 litre drums stored close to the aircraft parking area, on the eastern side of the runway.

The station's fuel is managed by the Deputy Station Leader (Air Force Captain).

Environmental management

Sound environmental management at Marambio was evident from the prominently displayed notices throughout the station on the Antarctic Treaty and Environmental Protocol. A "Welcome to Marambio" brochure sets out environmental management measures, including a detailed description of the station's waste categorisation system. The station was very tidy.

Marambio's ISO14001 Environmental Management System (EMS) was accredited in 2002. Considerable emphasis is placed on its implementation. The EMS was used to determine the environmental risks of the site and the preparation of appropriate response procedures. Document control of environmental (and safety) procedures appeared to be rigorous. Core documents were displayed throughout the station.

<u>Waste</u>

Most buildings contained colour-coded waste bins and posters setting out the categories of waste and the sorting required.

Marambio has a large dedicated waste management building. Here wastes are collected from field locations and from within Marambio and packed into used fuel drums for removal on the resupply ship. The Inspection Team was impressed by the thoroughness of this procedure, though it noted that it requires two staff dedicated to waste management during the summer.

Of particular note was the use of a diatomaceous product ("*Diatom 21*") to absorb fuel residues in 'empty' drums. One kilogram of this product absorbs up to three litres of fuel. Once this process is complete, the spent product is returned to Argentina for disposal. Sorted wastes are compacted in the clean fuel drums by a hydraulic press.

Drums are then painted with their waste category. At the time of the Inspection some 400 drums of waste awaited removal, mostly left behind from previous seasons.

Documentation concerning former waste disposal sites had been completed by the DNA in 1996. This remains the benchmark for station cleanup. Considerable effort has gone into cleaning up the precincts of the waste building. Drums previously stored beneath it and subsequently iced-in had been broken out and prepared for removal. The Station Leader made it clear to the Inspection Team that completion of this task was a high priority for this season.

On a wider scale, cleanup of the slopes of the plateau has been a less tractable problem, due principally to the extreme softness of the soil and resultant difficulty of access. A large number of partially buried fuel drums had already been removed from the slopes and gullies. However a decision about the practicability of removing the remaining drums and stockpiles of wastes from the less accessible slopes has yet to be made.

Sewage and domestic liquid waste is treated in a multi-stage sewage treatment plant. This is sited adjacent to the main complex. The plant macerates and settles out solids, then aerates and chlorinates the effluent before it is discharged just over the edge of the plateau onto ice-free ground. Solid residue is drummed and removed from the Treaty Area.

Protection of Flora, Fauna and Substrate

There are no concentrations of flora or fauna on the plateau. Local guidelines to minimise the disturbance of fauna by aircraft have been established. These are more stringent than those agreed at CEP VII[1], and are on display at the aircraft control and administrative buildings. They are also available on the Marambio intranet.

The extensive network of raised walkways within the station serves to protect the soft terrain from significant pedestrian impact and subsequent erosion. It also reduces the amount of silt that might otherwise be deposited into the meltwater catchment ponds.

Pollution Prevention and Control

Marambio has almost forty 20,000 litre fuel tanks. These appeared to the Inspection Team to be in very good condition. However, none has any form of secondary containment; they are all single-skinned and not bunded. Fuel handling procedures, from landing the rubber tanks by helicopter, to delivery to the powerhouse and supplementary tanks, appear to be well practiced and sound, based on documents and discussion with station personnel. Evidence of only minor spillage was seen near the powerhouse.

Nevertheless, the Inspection Team considers that the security of bulk fuel storage at Marambio presents a significant risk to the environment, including the catchment of the station's fresh water supply. A detailed risk-assessment and remedial action may be beneficial.

[1] In summary, no overflights below 2,000 ft; minimum 0.25 miles from coast; minimum 1,000 metres from wildlife concentrations; cross coast at right angles; avoid steep turns.

Tourism

No tourists visit Marambio though the station is visited by e.g. VIPs.

Summary

A large, dispersed station, operated by the military (Air Force) providing logistic support to other Argentine stations in the area. No scientific research was conducted at the station though observational data were collected on meteorology and ozone concentrations.

The focus of the station is to provide year-round air operations, both with links to Argentina, by C-130, and more locally with *Twin Otter* and helicopter. Much of the rationale for, and equipment of, the station is geared to this purpose – for example comprehensive weather forecasting capacity, radio communication, flight control, and heavy duty earth-moving equipment to ensure the runway is maintained through the year.

All aspects of the station's operation were being carried out in a thorough, competent and professional way. The Team was impressed with the widespread display throughout the station of Antarctic Treaty and Environmental Protocol-related information, including especially waste management procedures.

The means of providing bulk fuel annually to Marambio is highly labour intensive. It requires considerable helicopter support. But given the position of Marambio on an elevated plateau there is perhaps no alternative to what must be a very fuel-consumptive operation.

An aspect of Marambio that, in the view of the Inspection Team, warrants further attention is the supply of potable water for the base. Currently, this is provided by two relatively small man-made ponds less than 2 metres deep. These are not sufficient to supply the station during winter when they freeze almost solid. Instead, snow must be gathered and melted. The location of the ponds down-stream of much station infrastructure, puts them at risk of pollution, in particular from fuel spills. The new building under construction in the administration complex will also double as an emergency water reservoir, stored at room temperature.

From notices posted around the station it was apparent that water conservation was of importance. Melting snow for winter water supply of a station the size of Marambio must be both labour and energy intensive, and time consuming. The provision of a more reliable source of water by excavating larger, deeper freshwater ponds should be considered.

Recommendations

- that some form of secondary containment be provided to the bulk fuel tanks, particularly at the main fuel farm;
- that consideration be given to providing a more reliable source of freshwater particularly during the winter period. This might be achieved by excavating larger, deeper catchment ponds.

MR, TM, JR

Comments received from Argentina on this report are incorporated in Appendix 1

PETREL STATION (ARGENTINA): Inspected 25 February, 2005

Southern end of Petrel Station, looking south-east.

Introduction

Petrel Station is located at Lat. 63° 28'S; Long. 56° 13'W, on Welchness, at the western extremity of Dundee Island. Some of the station buildings sit on undulating ice-cored moraine. In front of the station is a distinctive long, wide and flat fine gravel beach. The station was established in 1967, but is now opened only intermittently during the summer by the Argentine Navy on behalf of the Dirección Nacional del Antártico. The serving Station Leader had opened the station in 1996, 2001, and 2003/04 (for 14 days).

Petrel has never been inspected before. Only two hours were available for this Inspection, due to logistic constraints.

Physical Description

Petrel has more the semblance of an abandoned site rather than a research station. It is spread over a large area, with up to one kilometre between the two main groups of buildings. At the northern end lie two disused fuel tanks, two small disused wooden sheds, a generator shed/workshop, and the main living quarters. The latter two, the only buildings currently occupied and/or used for purposes other than storage, are timber buildings on concrete foundations. These sit on dynamic ice cored moraine. Rock-filled gabion baskets had been put in place earlier this year in an attempt to stabilise the building.

A concrete helipad, well marked and maintained in good order, is located nearby the main living quarters. The Team was informed that an evaluation of the beach was being undertaken to assess its suitability for constructing a runway. This is surprising, given the proximity of the Marambio runway.

The remaining buildings are set on a spur approximately 1 km to the south, lined out in an east-west direction. These comprise: the remains of the original accommodation building which was burnt down in a fire (marked as Unsafe Access), a disused freezer store and the concrete foundations of a major generator building, a timber-framed single room building currently used to store 46 barrels of waste, a corrugated-iron building set on concrete piers (possibly a former vehicle garage) in which 70 old but good condition empty drums were stored (to be used to contain waste), a timber 12-bunk emergency accommodation building on concrete foundations, a large concrete–floored corrugated-iron aircraft hangar now storing a large volume of waste drums, and a similar but smaller hangar storing approximately 150 empty wooden crates. Behind this line of buildings, to the south, are two disused fuel tanks, and an extensive aerial array (also disused).

The buildings are generally in very poor condition. It is unlikely that the generator building or main living quarters will remain stable or safely habitable in the near future. The roofs of most buildings were leaking. Some attempts were underway to stabilise some of the buildings. In particular, the emergency accommodation building was being repainted, with a view to refurnishing it and establishing this as the main accommodation building.

Personnel

At the time of the visit, there were 12 Naval support staff and a civilian carpenter. The station complement had arrived on the *ARA Almirante Irízar* on 7 January, and were due to be collected on 21 March.

Scientific Research

No science was being undertaken at the time of the Inspection. A team of 4 geologists was however due to arrive on 4 March, for three weeks, to undertake baseline geology and glaciology. Some basic meteorology is also carried out.

Logistics

Resupply is carried out once a month on average by small boat or helicopter from the *ARA Almirante Irízar*.

Fuel is transported ashore in 205 litre drums. Up to 5,000 litres of Gas Oil, 1200 litres of Kerosene, and 1,000 litres of NAFTA are stored at the station, in drums. Fuel is transferred from drums to the vehicle or generator by rotary hand pump.

Power is supplied by one Deutz 25.5 kW (45 Amp/400V/31.5 kVa) generator. Fuel is transferred manually into a funnel-fed fuel tank (estimated at 30 litre capacity), fitted to the generator. Heating in the main living quarters is provided by portable kerosene-burning stoves, with a solid fuel stove in the dining area.

Water is collected from a glacial melt-pool, behind the station. A 2,000 litre non-potable water tank is located in the roof space, with a smaller (estimated 500 litre) drinking water tank, in the store room opposite the kitchen.

Transport and Communications

One Bombardier 4 x 4 ATV, with trailer, is used for transport purposes. Communication is by HF radio with Marambio, or VHF locally.

Safety, Training and Emergency Procedures

A naval nurse was present at Petrel. The station also had very modest medical facilities and supplies, including an emergency spinal board and oxygen tanks. There are no dedicated patient beds. In case of an emergency, medical evacuation would most likely be by Bell helicopter to Marambio Station.

Basic fire-fighting appliances included a hand rung fire bell, CO2 and dry powder extinguishers, and sand buckets. No smoke detectors were installed in any of the buildings.

A comprehensive programme of training is carried out in Argentina prior to deployment. However, the Team was not informed of any training exercises carried out this season.

Environmental Management

Environmental awareness at Petrel was high. The Team was shown comprehensive documentation prepared by the DNA, covering environmental procedures, instructions and legislation. The key objective for the station staff this summer was cleaning up waste from past activities at Petrel.

Waste Management

Current waste management was carried out to a high standard, as at other Argentine stations inspected. Colour-coded bins facilitated the segregation of waste into different categories. These were then sealed in 205 litre drums for removal from the Antarctic Treaty Area.

Sewage and grey water was pumped into a septic tank. The Team was informed that both solid sludge and liquid effluent, as well as organic kitchen waste, was removed in drums for safe disposal outside of Antarctica.

As well as managing current wastes, a commendable start had been made at cleaning up debris from past decades. Thirteen staff were tasked to clean-up operations for 40 days. At least 40 m^3 of waste had been gathered and banded or sealed in drums, though little plant or mechanical equipment was available to assist.

Protection of Flora and Fauna

At least 100 fur seals were hauled out on the beach at the southern shore of the Welchness headland. Skuas nest in the vicinity of the station. The Station Leader is responsible for briefing his staff on measures to prevent disturbance to flora and fauna. Guidelines were displayed in the main living quarters. There are no protected areas in the vicinity.

Pollution Prevention and Control

Refuelling of the vehicles was carried out from drums sat on concrete foundations in front of the living quarters and generator building. No spill response kit or absorbents were noted at the vehicle or generator refuelling points. The generator shed floor was tiled and, in the event of a spill, would act as a sump to contain the full contents of the fuel tank.

The team were shown 20 drums of contaminated rocks that had been collected by this year's team in an effort to clean up past activities. A further 10,600 litres of Gas Oil (diesel), 11,000 litres of JP1 aviation fuel (paraffin), and 1,800 litres of NAFTA, were due to be removed from the station.

Summary

Petrel Station is a large but ageing and poorly equipped station. Many of its buildings and infrastructure (including the extensive aerial array) are no longer used. The station has no science facilities. The significant effort and commitment of the staff at Petrel to clean up and stabilise the existing station was noted by the Inspection Team and is to be commended. However, the Team was unable to ascertain whether there is any long–term strategic aim for Petrel, in terms of a major clean-up, refurbishment, or the introduction of a comprehensive science programme at the station.

Recommendations

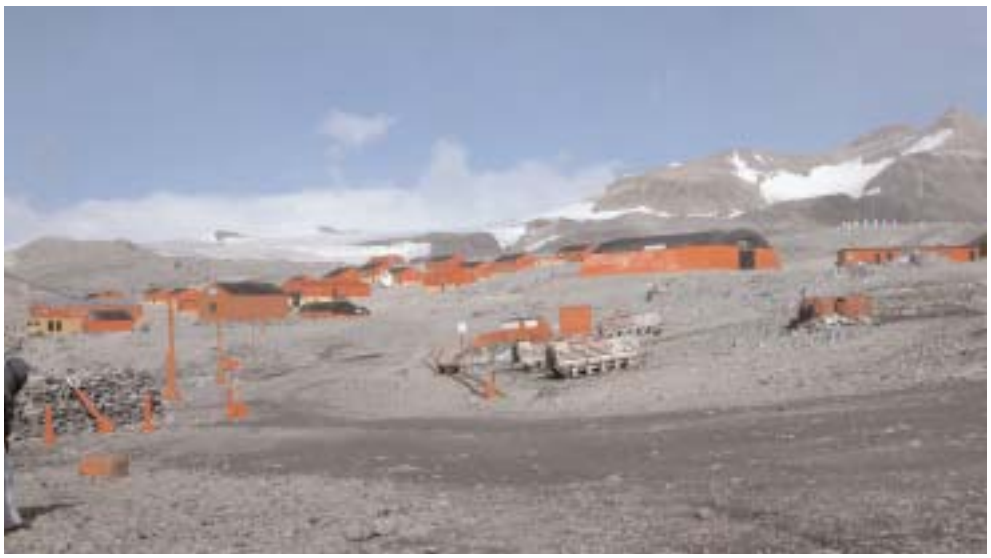
- As a minimum, smoke detectors should be installed in the buildings to ensure the safety of the staff working there;

- At a more strategic level, consideration should be given to the long-term requirement for Petrel Station. If the decision is taken to retain this station, then major investment will be needed. This should include scientific facilities. In the absence of such resources, the removal of Petrel and remediation of the station area should be considered.

RD

Comments received from Argentina on this report are incorporated in Appendix 1.

ESPERANZA (ARGENTINA) : Inspected 11 February, 2005



General view of Esperanza

Introduction

Esperanza was established as a permanent station in December 1953, and is operated by the Argentine Ministry of Defence (Army) through the Dirección Nacional del Antártico. Facilities exist at the station for the families of the military support personnel. Science is co-ordinated through the Instituto Antártico Argentino.

The dispersed station buildings are situated inland from the sheltered anchorage of Hope Bay, Trinity Peninsula on rising gravel/rocky ground at Lat. 62° 24'S; Long. 57° 00'W.

Five hundred metres to the south of Esperanza is the single-building Uruguayan station T/N Ruperto Elichiribehety (formerly 'Base D', Hope Bay (UK) - see separate report), whilst the Chilean station General Bernardo O'Higgins is 45 km to the west.

Esperanza was last inspected in 1999 by the UK/Germany and previous to that in 1993 by the UK/Italy/Korea, and in 1980 and 1964 by the USA.

Physical Description

Esperanza is an extensive base which resembles more of a village, due principally to the numerous (13) chalets which accommodate married personnel and their families. All buildings, irrespective of age, were well maintained and uniformly painted orange and cream with black roofs.

The buildings and infrastructure are contained within an area 400 metres by 600 and date from 1952, with a major expansion in 1978 when most of the chalets were built. The only building new to the station since the last Inspection was a sewage treatment plant. This was built to the north of the main accommodation and dining block (the "Casino") in 2000. Other station buildings contain facilities for waste management (including an incinerator and compactor), vehicle storage and maintenance, power generation, clothing and field

equipment storage, meteorology, communications and various other stores. There is also a school for the children of the support personnel.

The medical building contains a pharmacy, a small operating theatre, dental suite, consulting rooms and general infirmary with beds for six patients.

A small museum has been established in a corrugated steel-ribbed arch-framed building. This houses a collection of curated local fauna plus interpretative display material. Nearby are the reconstructed remains of the 1903 Swedish Nordenskjöld hut (HSM No. 39) and a roped-off area containing a display of former station vehicles and equipment.

A helipad at the northern end of the station has now been decommissioned, covered with gravel, and the area roped off to protect the adjacent Adélie penguin colony. A new concrete helipad has been established at the southern end of the station with access ramp and tie-downs, well clear of wildlife concentrations.

Access around the base is via a 1.5 km network of cleared tracks of compacted fractured rock extending from the pump-house at Boeckella Lake in the southwest, through the station to the waste management building and pier in the north.

The Inspection Team was advised that three refuges are maintained in the vicinity of the station:

Malvinas	Lat. 63^{o} 25'S; Long. 56^{o} 59'W
Independencia	Lat. 63^{o} 27'S; Long. 59^{o} 11'W
Cana Montalva	Lat. 64^{o} 32'S; Long. 57^{o} 24'W

Logistics and Infrastructure

Esperanza has a diesel fuel (GOA – Gas Oil Antarctic) storage capacity of 335,000 litres in twenty-nine 10,000 litre tanks and three 15,000 litre tanks. These are located 200m to the southwest of the station. The tanks are top-fill, but not bunded, and sit on individual concrete pads. Materials were on hand and work had commenced to connect the pads with reinforced concrete and complete a bund wall around the entire fuel farm. Diesel is also used in vehicles and for central heating boilers (e.g. in the chalets) and is delivered by a mobile fuel bowser of 12,000 litre capacity.

Fuel is delivered to the station by helicopter in 1,800 litre rubber rolling tanks and pumped into the bulk storage tanks. From here, it is gravity fed as required through above-ground steel pipes to a day tank in the nearby powerhouse. Fuel transfer is monitored by a person at each end of the line and from the control panel at the powerhouse. The day tank is fitted with an overfill alarm.

The bulk fuel-farm at Esperanza. The building materials in the foreground are for constructing an overall bund around the tanks.

A further 10,200 litres of drummed fuel is stored separately adjacent to the bulk fuel farm for vehicle and incinerator use. In addition, 6,000 litres of JP1 in drums is held for aircraft use. Overall fuel management is the responsibility of two station personnel. Three Caterpillar generators, each of 130kW, consume 216,000 litres of GOA annually. Power generation is backed up by a 96kW standby diesel generator. Electrical supply cables are mostly underground. There are no alternative energy sources.

Water is plentiful and is supplied to the station direct from Lake Boeckella, 500m to the southwest. From here, water is pumped to a small tank, filtered and then gravity-fed to the station for general use. Drinking water is further processed by a Reverse-Osmosis (RO) plant housed in the main accommodation block. RO effluent is discharged to the sewage treatment system.

The station uses approximately 10,000 litres of water per day, an average of 114 litres per person per day.

Personnel

Logistic support and administration were provided by Army staff. At the time of the Inspection, there were 88 personnel on the base, of whom 10 were scientists and some 25 accompanying spouses and children of Army staff. Station numbers were expected to drop to 66 for the coming winter, including accompanying families and seven scientists.

The usual length of tour for support staff is one year, with staff changeover normally taking place during January/February. The Station Leader at the time of the Inspection was an Army Lieutenant Colonel, who had experience of three previous winters at Esperanza.

Science

The Inspection Team noted that ten scientists were working at Esperanza, an increase over the four present in 1999. A four-person Argentine/Spanish seismology programme working in conjunction with Italy inputs its data directly by satellite into the global seismic network. A two-person biology team was studying seabird diet in a modest biology laboratory.

While the increase in the number of scientists present at the station is to be commended, science facilities remain very modest and are most likely at the limit of their capacity. The seismometer and associated programme are housed in a corrugated fibreglass shelter and hut, while the biology laboratory consists of two small shipping containers. The Inspection Team was informed of plans to convert one of the domestic chalets into laboratory accommodation, although no timetable for this was given. Whilst this proposal is welcomed, the scale of Esperanza and its logistic support facilities, could readily accommodate a much more extensive science programme, and consideration should be given as to how this can be achieved.

Other research programmes supported by Esperanza include surface meteorology observations, glaciology, and tide gauge measurements. The tide gauge was installed by the US National Oceanic and Atmospheric Administration (NOAA) adjacent to the pier and feeds data directly every three hours to the Argentine station Vice Comodoro Marambio and the NOAA system in the USA.

Environmental Management

The station management was clearly very familiar with the requirements of the Environmental Protocol and co-operates closely with the Environmental Office of the DNA in Buenos Aires.

<u>Waste Management</u>

Wastes were separated at source into different categories (e.g. glass, plastics, paper etc) and returned to Argentina for recycling or safe disposal. An extensive dedicated waste management building is located to the north of the station. A twin-chamber incinerator and a waste compactor were housed in this facility. Waste boxes were colour-coded according to the different categories, and most were stored inside this spacious waste facility.

A comprehensive Waste Management Handbook was made available to the Inspection Team. Total quantities of waste are recorded and reported to the DNA and the Army on a monthly basis. Two staff, the Doctor and Nurse, are responsible for co-ordinating waste management at Esperanza. Staff receive waste management training in Argentina and on arrival at the station.

A new chemical sewage treatment plant had been installed since the 1999 Inspection. This is housed in a dedicated building adjacent to the main living quarters. The new plant houses a three stage biological digestor receiving macerated sewage from the various buildings of the base twice a week. Solid, treated sludge is removed for disposal in

Argentina, and the treated liquid effluent discharges to the bay via a pipe which extends below the low tide mark. The Team was informed that the effluent is tested once a year when the *ARA Almirante Irízar* undertakes relief of the station.

Environmental Impact Assessment

The Station management was aware of the requirement for Environmental Impact Assessment. Such assessment would normally be undertaken by the Environmental Office of the DNA. None had been required this year.

Protection of Flora and Fauna

The station is bounded by a large Adélie penguin rookery (approximately 150,000 pairs) to the north and west. The rookery is roped off to prevent access by pedestrians or vehicles. Aircraft are prohibited from over-flying it. A helipad, located at the north east of the station approximately 70 metres from the rookery, has now been decommissioned. Leaflets were available providing guidance for staff and visitors on how to avoid causing disturbance to wildlife.

Permits had been issued by the DNA for the biological investigations being undertaken this season at Esperanza.

Pollution Prevention and Response

The Team was shown a comprehensive Oil Spill Contingency Plan for the station, and was informed that fuel absorbents and inflatable booms are available for incidents on land or water. Monthly oil spill response exercises were carried out.

Protected Areas

ASPA 148, Mount Flora, is located approximately 2 km from the station. Its Management Plan, including maps, was available on the station. Four geological staff (two from the Instituto Antártico Argentino and two from the Instituto Geografico Minero de Espana) had been issued with permits by the DNA this season to undertake geological investigations.

Tourism

Esperanza is visited regularly by tourist vessels. This season (up to 4 February) seven IAATO-affiliated cruise ships had visited the base, with a total 1,163 passengers landed ashore. One private yacht had also visited, with 12 passengers.

Esperanza has a comprehensive Tourist Management Plan, which was made available to the Inspection Team. Prior notification for visits is required. Generally, tourists are taken on a guided tour in groups of no larger than 30 persons to visit the station facilities, where they learn about scientific and logistic activities. Visits to the adjacent Adélie penguin rookery are accompanied by base staff. Visits are also made to the Esperanza museum, and HSM No. 39, the remains of a stone hut in which a three-man party from

Nordenskjöld's Swedish South Pole Expedition party over-wintered in 1903. The HSM is roped off to prevent access/ disturbance.

The tourist visitor guidelines previously displayed at the 'Puerto Morro' pier (reported by the UK/ German Joint Inspection Team in 1999), were no longer present.

Summary

The layout and operation of the station was much as reported in the Inspection Report of 1999. There were however some notable changes, all of a beneficial nature and to be commended.

(i) A new sewage treatment plant had been constructed four years ago just to the north of the main living quarters (the "Casino"). Prior to that, macerated sewage had been discharged directly to sea. Solids from the plant are now removed to Argentina, and effluent is discharged to the sea;

(ii) The UK/German Inspection Report (1999) commented on the modest scale of science previously being undertaken at Esperanza. It was therefore pleasing to see that science capability had expanded in scope and number of scientists since then. Ten scientists were on base at the time of the Inspection including two Spanish exchange geologists. There were also strong links to the Italian national programme on seismology. Despite this, science facilities remain very modest with small, cramped laboratories housed in shipping containers. The Inspection Team was informed that one of the nearby accommodation chalets was due to be converted into laboratory space, and this is to be welcomed. Despite this, Esperanza could well accommodate a much higher ratio of scientists on the base and consideration should be given to that investment;

iii) The configuration of the bulk fuel farm was unchanged from that reported in the 1999 report. The Inspection Team was informed of the imminent construction of an integrated concrete pad and bund around the tanks. This was expected to be completed in the current season. The necessary materials were already at Esperanza, and at the time of the Inspection steel reinforcing was being assembled for the job.

These three features of enhanced sewage treatment, improvements to the bulk fuel storage, and an expansion of the science programme are all welcome.

Recommendation

- Due consideration should be given to further expanding upon, and enhancing, the scientific programme undertaken at Esperanza.

TM, RD, MR, JS

Comments received from Argentina on this report are incorporated in Appendix 1.

COMANDANTE FERRAZ STATION (BRAZIL) : Inspected 10 February, 2005

Introduction

Comandante Ferraz Station was established in 1984 as a permanent facility and is operated by PROANTAR, the Brazilian Antarctic Programme. The Brazilian Ministry of Science and Technology is responsible for the scientific research carried out there, and the Ministry of Environment is responsible for environmental issues. The station is located at Lat. 62° 05'S; Long. 58° 23'W on the eastern shore of the Keller Peninsula, Martel Inlet, at the northern head of Admiralty Bay, King George Island.

The front view of Ferraz Station.

The station is compact in nature, consisting primarily of an amalgamation of 20ft modified shipping containers. It is set approximately 8-10 metres above the shoreline on a pebble/boulder beach. Arctowski Station (Poland) lies 10 km south-west across the bay at Point Thomas. Machu Picchu Station (Peru) is 4 km to the west in Mackellar Inlet. Two other facilities are also present in Admiralty Bay - the Ecuadorian refuge Vicente at Hennequin Point and the US field hut, Peter J. Lenie, south of Arctowski at Llano Point.

Personnel

The maximum population at Ferraz Station is 46. The total number of personnel on station at the time of the Inspection was 42, comprising 20 scientists, 10 naval support staff and the remainder civilian support staff. Wintering numbers vary. Usually, there are 10 support staff, and between 3-7 scientists.

Scientific Research

Ferraz operates an active and wide-ranging scientific programme consisting of marine biology, oceanography, ornithology, zoology, micro-biology, ozone measurements, atmospheric physics, environmental monitoring and terrestrial habitat management. Around 50 % of the station's complement were scientific with at least two senior academics (University Professors) present at the time of the Inspection. At least 4 Brazilian universities and research institutes are involved in scientific investigation at Ferraz. No exchange scientists were present. The Team encountered considerable enthusiasm amongst the station personnel towards the science programmes being undertaken.

Nine shipping containers housed well-found laboratories. Six were located within the covered station complex. These consisted of two aquaria, three biology and a general purpose laboratory. A range of common laboratory chemicals are held (e.g. formalin, ethanol). Three laboratories situated on a slight hill to the south of the station were used for meteorology and physics, including ozone measurements.

The laboratory area showing the arrangement of the shipping containers.

Physical Description

Ferraz is a relatively compact station with most of its functions grouped within one composite building. This largely consists of shipping containers bolted together, though other larger wooden prefabricated wooden structures, such as the gymnasium, garage and generator shed are present. Some of the containers date back to the original installation of the station in the mid-1980's, and are beginning to show their age.

An interesting feature of the station is the grouping of the containers housing the laboratories under one expansive roof – allowing most movement within the station to be carried out indoors. This area of the station is floored with interlocking concrete paving blocks. The outlying buildings consisted of an emergency communications building. This is set amongst the concrete foundations of the UK's former 'Base G', Admiralty Bay, (dismantled and removed by Brazil in the mid 1990s following agreement with the UK).

In addition, there are some meteorological buildings to the south and a physics laboratory to the north-west (the latter was not inspected). The team was informed that there is no intention to increase the size of the station or its personnel capacity. The view is that the current situation is optimum for the environs of Keller Peninsula. There is, the Team understood, a 10 year plan to optimise the station's layout through refurbishment and rearrangement, with for example the gym ear-marked to become an enlarged library.

Certain logistic functions of the station are grouped under the single 'roof'. These included an attractive and well appointed lounge, kitchen, radio communications room, pantry, drying room, sleeping quarters, (mostly two bed units), a 27 seat TV/cinema room, gymnasium/outdoor equipment room and a well used, though relatively cramped, computer suite adjoining the library.

More external functions, though still within the same complex, were sited away from the living accommodation area. These included the incinerator and waste management room, the laboratories, stores, garage area and, at even greater distance from the accommodation, the generator building and vehicle refuelling tank.

Logistics and Infrastructure

The base is resupplied once a year by the Brazilian Naval vessel *Ary Rongel* (H414). Cargo and personnel are brought ashore primarily by 2 Squirrel helicopters operating from the vessel. The vessel was at anchor in Martel Inlet at the time of the Inspection. Personnel also arrive or depart from Ferraz via *Hercules* C–130 aircraft operated by Chile out of Frei/Marsh. Brazilian C-130 aircraft conduct supply drops every 3 months, including during the winter.

Bulk re-fuelling is carried out with the use of 13,000 litre fuel barges. Two such barges were on the beach at the time of the Inspection, although it was understood that only one was used. Bulk Diesel Fuel Arctic (DFA) is transferred from ship to barge, towed ashore and then transferred from the barge to the bulk fuel tanks. This is probably a time consuming operation. It is carefully monitored, with contact between staff at either end of the hose via VHF radios. Fuel hoses are emptied by gravity. The bulk fuel farm consisted of 17 tanks with a capacity of 15 to 17, 000 litres each. These sit on concrete plinths. All tanks are double-skinned and well maintained with no obvious sign of leakage. Drip-retention measures were in place although the Team understood that the close configuration of the tanks meant that snow accumulation hampered access to the pipes and valves during winter. Some means of providing covers around the base of the tanks to reduce this problem were being considered. Annual fuel consumption is approximately 300,000 litres.

Fresh water is pumped directly from two lakes fed by glacial melt to the north and south of the station and is plentiful year-round. It is filtered and daily needs are met from a holding tank.

Transport and Communications

Ferraz is equipped with a large, well constructed and maintained metal helipad, to the south of the main station complex. This is elevated two metres off the ground with extensive storage space below. A wide ramp up to the pad provides easy access for loading cargo. Helicopter flights are made from the nearby Chilean Marsh Station, or from visiting ships.

The station was equipped with a range of vehicles, including 7 ATVs plus trailers, 2 snow mobiles, 3 caterpillar tractors, 1 mobile crane, 1 forklift truck and 3 tracked *Bombardiers*. A large garage was situated towards the north of the station, adjacent to the generator shed.

A steel launch (*Skua*) of about 6 metres length was ashore on the beach in a cradle. This is launched by means of an extended rigid towbar attached to a caterpillar tractor. This craft is used for in-shore marine biology. Five smaller boats (Zodiac inflatables) are also used at the station.

Communication was provided by HF, VHF and satellite. There is 24 hr internet connection and internal and external telephone systems.

Safety, Training and Emergency Procedures

An intensive training programme is carried out for staff visiting Antarctica for the first time. Refresher courses are arranged for returnees. Training is varied and wide ranging, and includes health and safety, first aid, firefighting, environmental protection, field training and the use of communications equipment.

Oil spill response exercises are carried out at least once every year.

Environmental Management

PROANTAR, Brazil's national Antarctic programme, places considerable emphasis on environmental issues and compliance with the Environmental Protocol. Environmental awareness amongst the staff at Ferraz was high. The station environs were neat and well maintained.

<u>Waste management</u>

All waste apart from food waste, sewage and grey water are removed from Ferraz for recycling or safe disposal in Brazil. Waste is separated at source – the following categories were noted by the Inspection Team: waste oil and lubes, paper, glass, metal, plastic, steel/aluminium cans, clothes, fluorescent lamps and general waste.

Waste bins were clearly marked by category although there was no general information (e.g. posters) about waste segregation apparent on the notice boards.

Waste management is co-ordinated by a designated waste official at Ferraz. A waste management container unit houses two compactors and an incinerator. The incinerator

operates on diesel and burns at a temperature of 700° C. Ash is sealed in general waste drums and returned to Brazil.

Sewage and grey water is treated in a three-stage passive filtration system. Treated effluent is discharged to Martel Inlet. Solids are sent to Brazil for safe disposal.

Environmental Impact Assessment

Staff were broadly aware of the requirement for Environmental Impact Assessment, although such assessments would be undertaken by the PROANTAR Environmental Officer, who was not at the station at the time of the Inspection. No EIAs were made available to the Inspection Team.

Protection of Flora and Fauna

Posters were present at several locations around the station notifying staff of the recommended distance to keep from birds and seals to prevent unnecessary disturbance. Scientists working with fauna were issued with permits from the Brazilian national authority.

A comprehensive and detailed land management GIS database had been prepared by PROANTAR for the Keller Peninsula. Areas of vegetation and nesting seabirds to be avoided by staff were highlighted, and paths/routes to follow shown. However, this mapping and monitoring seems to have been prepared independently of the management provisions of the ASMA for Admiralty Bay, and no progress on this voluntarily adopted ASMA Management Plan was apparently being made. Furthermore, there seemed to be little, if any, cooperation with nearby Arctowski (Poland) on this plan.

Tourism

Ferraz is not frequently visited by tourists. This season, only one cruise ship - M/V *Nordnorge*, with 300 passengers onboard, had visited. These had been managed ashore in groups of 30 persons. They had been shown around the base facilities, including the laboratories. No difficulties were reported.

Summary

A relatively compact, medium-sized station undertaking a wide-ranging science programme. An interesting feature of Ferraz is the extensive use of shipping containers for many of the station's facilities. These include accommodation units, laboratories, radio communication, kitchen etc. With the exception of the meteorological buildings, and physics laboratory, the station was all under one roof. Within this, stores, laboratories, garage workshops and the generator shed were all located away from the accommodation block.

Certain sections of the station are beginning to show their age, particularly those units installed initially. The Team was informed that Ferraz is not expected to increase in size either in terms of persons or extent of station. The view was that over the next five years an 'optimisation plan' will be undertaken to rationalise station facilities and provide better working facilities; for example more space for the library and computer suite. Ferraz was considered to be at maximum carrying capacity for the local area of Keller Peninsula. There was a high environmental awareness on the station, and detailed mapping and management zones had been established for the Keller Peninsula. The Ferraz helipad was particularly well constructed and maintained.

Recommendations

- International scientific collaboration could be strengthened. For example, closer co-operation could be maintained with the Polish Academy of Sciences working at Arctowski, in particular over near-shore marine biology;

- The commendable land management zonation and GIS mapping of the Keller Peninsula could be extended. Again, further co-operation with the Polish Academy of Sciences over the revision and development of a formal Management Plan for the whole Admiralty Bay Antarctic Specially Managed Area (ASMA) would be beneficial;

- Consideration should be given to a covered bund for the main fuel farm;

- A review of fire-fighting equipment should be undertaken as a matter of urgency. The station has an advanced fire detection system already installed, though this did not seem to be matched by fire suppressant systems. This is particularly the case for the accommodation block;

- PROANTAR and the UK (British Antarctic Survey) should liaise to produce an appropriate commemorative/interpretative plaque to be installed at the site of the former UK 'Base G', Admiralty Bay;

- Due consideration could be given to the protection of the whalers' waterboat located on the beach to the north of the station.

TM, RD, MR

Comments received from Brazil on this Report are incorporated in Appendix 1.

KING SEJONG STATION (REPUBLIC OF KOREA): Inspected 14 February, 2005

Introduction

King Sejong is located on South Spit on the southern shore of Marian Cove, Maxwell Bay, King George Island at Lat. 68° 13' S; Long. 58° 47' W. This permanent station was established in February 1988. Most of the station's infrastructure dates from that period, though some elements have been added recently.

The station has a strong focus on scientific research and is operated by the Korean Arctic and Antarctic Research Programme (KAARP), which is part of the Korea Polar Research Institute, Korean Ocean Research and Development Institute (KORDI). The nearest stations to King Sejong are Teniente Jubany (Argentina) 5 km to the southeast and Artigas (Uruguay) 7 km to the northwest.

The station has been inspected a number of times before, the most recent being by the US in 2001, Argentina in 1995 and the UK, Italy and Korea in 1993.

Physical Description

Aerial view of King Sejong Station showing the newly constructed wharf and dock in the foreground. The two sets of bulk fuel tanks are set to the left, and in the middle distance.

King Sejong station consists of 19 buildings of various types of construction, principally steel and foam sandwich panel, raised on steel pylons with concrete footings. Emergency accommodation and some minor laboratory facilities are housed in insulated shipping containers. The generators and main storage facilities are in arched-ribbed steel buildings.

The main accommodation and laboratory buildings are grouped in two rows about 15 metres apart, parallel to and 5-10 metres above the shoreline. A network of gravel tracks connects the station buildings, the wharf, fuel farm, helipad and remote stores buildings. All buildings are painted a distinctive orange-red. Most date from 1988. Later additions included a high-roofed garage (built in 2000) to the south of the station to house the crane, *Hagglunds* and snowmobiles, and a boat store built in 1999 for the two Zodiac inflatables adjacent to the generator building.

The elevated concrete footings of some of the buildings were noted to be severely decayed. Services for the buildings run through pipes suspended beneath the building floors. Apparently these remain accessible in winter due to the scouring effect of the prevailing winds. These keep the subfloor area clear of snow. Some pipework, which had previously provided marine diesel to oil-fired heaters in each building is no longer in use.

Heating in the domestic buildings is now provided by electric radiators.

Personnel

At the time of the Inspection the station complement was 16 civilian personnel. In addition two Hungarian geographers/geomorphologists were based temporarily at the station. It was emphasised that this complement of 16 represented only the overwintering team who had arrived on site in mid December. Numbers on the station had been considerably higher one month earlier with around 50 scientists alternating between the station and a research vessel operating in the vicinity. The maximum capacity of the station is 50-60 personnel.

The overwintering personnel consisted of 4 scientists including the Station Leader, 2 meteorologists, a doctor, cook, deputy leader, and 7 technicians. Three staff members had overwintered previously, so providing continuity and expertise. Length of tour of personnel on the station was usually one year with changeover normally occurring late in November or December. Certain staff, e.g. the doctor, were working for KAARP in lieu of undertaking conscriptive military service.

The Inspection Team was informed that Korea has recently introduced a scheme to allow non-KAARP staff to visit King Sejong. Earlier in the season 2 teachers, an artist and a photographer had been hosted for 2 weeks on the station. In addition, ten officials of several Korean Departments such as the Board of Audit and Inspection, Ministry of Science and Technology, and Ministry of Maritime Affairs and Fisheries had undertaken an inspection visit to the station in the summer of 2003/04.

Scientific Research

It was very evident that the primary focus of King Sejong is scientific research. Up to 50 scientists from the KAARP may be working at the station during the summer period, augmented by colleagues from Korean universities. Scientific projects include geology and geophysics, glaciology, marine biology and oceanography, upper atmospheric physics, and environmental monitoring.

During winter the science complement decreases (to four at the time of the Inspection) to include a geophysicist, marine biologist, and a microbiologist. The Station Leader, who is an eminent glaciologist, was also undertaking atmospheric analyses including of heavy metals. Two meteorologists were also present.

Science facilities on the station were of a high quality. A newly constructed microbiology laboratory was located just to the west of the pier, from where continuous analyses of seawater were undertaken. A separate building housed the upper atmospheric research

laboratory with an all-sky camera, atmospheric chemistry laboratory and a seismology laboratory.

A Brewer spectrometer was sited adjacent to the main laboratory building.

Logistics

Personnel are transferred to and from King Sejong via Frei Station and Punta Arenas, Chile. This means of logistics is also used to deliver fresh food to the station during summer. Bulk fuel is delivered to the station every 2-3 years by chartered vessels.

Power is provided by four Caterpillar generators (2 at 275 kW and 2 at 225 kW) running only one at a time. Emissions from the generators were neither filtered nor monitored.

The floor of the generator building consisted of heavy wooden planking with direct access to the gravel substrate below. There was no spill containment beneath the generators.

Bulk fuel (Marine Gas Oil) is contained in six cylindrical tanks positioned in two well separated sets of three – one to the south of the station on elevated ground close to the station's water supply lake, the other set to the east. Each tank containing 150 tonnes sits on elevated steel plinths on concrete foundations. Tanks were single-skinned, insulated and covered with a stainless-steel jacket. The tanks are not bunded, although the Inspection team noted that the provision of bunding had been a stated intention back in 1993.

Fuel is pumped ashore through floating hose to the lower tank farm. From here, it is pumped to the higher set of tanks. Fuel is then gravity-fed to the power house through steel pipework mounted on above-ground supports. Fuel transfer is monitored visually. The refuelling hose is emptied by gravity.

Annual consumption is around 260-280 tonnes (i.e. the station holds more than three years' supply of bulk fuel). The Team was informed that the station had experimented with solar panels although this had not proved successful. There is however the intention to trial wind generators.

Water supply in summer is provided by a dammed man-made lake. Water is filtered prior to use. During winter a Reverse Osmosis (RO) plant is used instead. This produces an adequate supply to meet the daily consumption of around 6 tonnes. Water is stored in a 20 tonne tank within the RO building. The intake for the RO plant is a borehole sunk into the beach and protected by rock armouring to reduce the potential for ice damage.

<u>Transport and Communications</u>

Radio communications are HF and VHF. There was also a permanent satellite phone and internet link to the Chilean telephone network. A local area network was installed at the station.

Vehicles on the station consisted of a *Hagglund ATV*, two snow mobiles, two trucks, two 4x4s, a forklift truck, a 20 tonnne crane, excavator and *Piston Bully* snow-plough. A mini-bus was also housed permanently at the Russian Belllingshausen station for the transfer of Korean personnel from Marsh runway to the beach at Frei/Bellingshausen. Around 60 metres of track existed within the station, and then to the large store-sheds to the east.

Two large Zodiac inflatables were housed in a separate boat shed adjacent to the generator building. The larger of the three was apparently capable of holding 24 personnel. Zodiacs were used as the means to transfer personnel and stores between Frei/Bellingshausen and King Sejong – a distance of approximately 10 km. In addition, the station possessed a motorised landing craft to offload cargo. At the time of the Inspection, this was laid up on the beach to the east of the two large arched-ribbed steel buildings on the shoreline of Marian Cove.

To provide better cargo-handling facilities, the jetty in front of the station had just recently been rebuilt. This was around 15 x 10 m with steel-piled armouring and decking of heavy gauge wooden planking. A steel-piled dock had also been constructed adjacent to the jetty to provide greater shelter during unloading operations. A small, well maintained and elevated helipad with a plastic lattice surface was situated to the west of the station complex. Helicopter movements were however infrequent.

Safety, Training and Emergency Procedures

A resident doctor is present as part of the overwintering team, and modest surgical facilities are available, along with a single bed medical ward. More serious cases would require evacuation via Marsh Station either by helicopter or Zodiac.

Personnel were trained in waste management procedures and the need to minimise the impact of wastes on the environment.

SAR provisions at sea would be provided by the station's Zodiac inflatables. The station possessed a fire emergency plan with constant video monitoring of high risk areas. Smoke alarms were networked throughout the buildings and a night-watch was instigated. The station was extensively equipped with fire extinguishers (120 throughout the buildings) and personnel were trained in fire-fighting with monthly fire-fighting exercises. An interesting feature of the station was the automatic weather recording provisions in the main accommodation blocks. These provided details of wind speed, temperature, relative humidity etc.

Environmental Management

The Station Leader who escorted the Inspection Team was very familiar with the requirements of the Environmental Protocol.

Waste Management

Labelled waste receptacles were installed at the entrances to most buildings for the separation and collection of paper, plastic, glass and steel/aluminium tins. All waste, apart from organic waste and sewage, is removed from the Antarctic Treaty Area. Hazardous waste, such as laboratory chemicals and waste oils/lubes, are returned to Korea for safe disposal. Non-hazardous wastes are returned to Punta Arenas, Chile, for disposal or recycling. A twin-chamber incinerator, fuelled by diesel to burn at 580°C is used to incinerate organic waste. This is fitted with a particulate scrubber. The ash is collected in drums and sent to Chile for disposal. A small compactor was also used to reduce the volume of non-hazardous waste.

One person was designated to co-ordinate waste management on the base. A report is submitted annually to the KAARP.

A Rauma Repola (Finland) chemical sewage treatment plant was located alongside the RO plant. Treated liquid effluent is chlorinated before discharge to sea. Solid sludge is dried with the use of a flocculant, and removed for disposal in Chile.

Environmental Impact Assessment

The Station Leader was aware of the requirement for Environmental Impact Assessment, which must be submitted to the Korean Department of Foreign Affairs & Trade. An IEE had been undertaken for the recently constructed pier.

Protection of Flora and Fauna.

A baseline survey of vegetation in the immediate vicinity of the station had been conducted, and mapped. Population growth of Antarctic hairgrass *Deschampsia antarctica* around the station is monitored.

Illustrated guidelines based upon Recommendation XVIII-1 were on display at a number of locations around the station.

Pollution Prevention and Control

The Team was unable to ascertain the existence of a station Oil Spill Contingency Plan. However, the Station Leader informed the Inspection Team of the availability of floating booms and absorbents in case of fuel spillage. The station's engineer had been trained in Korea to respond to fuel spills.

No fuel contamination was apparent around the bulk fuel tanks. However, of concern to the Inspection Team was the contaminated soil in the un-floored garage/vehicle maintenance building. There was an apparent cumulative build up of fuel residue, at least to a depth of 50 millimetres.

Protected Areas

No ASPAs are in the near vicinity. The nearest ASPA is No. 132 at Potter Peninsula.

Tourism

No tourists had visited King Sejong this year.

Summary

King Sejong is clearly well equipped to carry out a range of scientific research, and the ratio of scientific staff to logistics support personnel was high, particularly during the summer period. It was evident that maintenance of the station was carried out routinely, and to a high standard. The accommodation buildings were very well appointed and comfortable.

The Inspection Team was of the view that further consideration should be given to the containment of the two bulk fuel farms, particularly given that any spillage of oil would likely impact the two sources of fresh water for the station (the RO intake and the man-made lake). Similarly, containment provisions could usefully be deployed in the generator building.

Recommendations

- Given the significant quantity of fuel stored in the bulk tanks, and their proximity to both sources of water supply, serious consideration should be given to conducting a risk assessment of major spillage, and to determine whether additional containment provisions around the fuel farm are warranted;

- Consideration should also be given to flooring the garage workshop and implementing measures to prevent spillage, and to fitting drip-trays or similar underneath the generators.

JR, MR, TM , RD

Minor drafting comments of a factual nature received from the Republic of Korea have been incorporated in this report.

BELLINGSHAUSEN (RUSSIAN FEDERATION): Inspected 16 February, 2005

The recently constructed Russian Orthodox Church at Bellingshausen, seen over some of the station's fuel tanks

Introduction

Bellingshausen is situated on the northern shore of Maxwell Bay, King George Island, at Lat. 62° 12'S; Long. 58° 56'W, immediately to the east of the Chilean station Presidente Eduardo Frei, to the extent that the two stations merge. Bellingshausen is one of six permanent stations located on Maxwell Bay.

The broader environs of the base are clearly impacted by vehicle use, and a system of vehicular tracks links Bellingshausen with the adjacent Frei Station. Tracks also extend southwards to Great Wall Station (China); eastwards to Artigas (Uruguay) and to the station's large bulk fuel tanks 3.5km to the north east, at Rocky Cove.

The station is operated by the Russian Arctic and Antarctic Institute (RAAI) in St Petersburg which is managed and funded through the Russian Hydrometeorological Ministry. At the time of the Inspection the 49th Russian Antarctic Expedition was still in progress, with handover to the 2005 wintering personnel due in April.

Bellingshausen was last inspected by the USA (2001), and prior to that by the UK and Germany (1999). Many changes were apparent in the composition and operation of the station.

Physical Description

Bellingshausen comprises around 14 large buildings and a number of smaller storage facilities and shipping containers. Most are grouped to the east of the stream flowing out of Lake Kitezh. Although this loosely marks the boundary between Bellingshausen and Frei, some Russian buildings including a garage, store, and accommodation block lie to the west of the stream. The older, red buildings at Bellingshausen date from 1968 when the station was established. These include the messing block, administration offices, hospital, and accommodation buildings. More recent buildings are clad in galvanised or zinc-alume metal sheet and include the substantial garages, waste incineration building, and power plant. These were constructed between 1992 and 1994.

The environs of Bellingshausen and the condition of a number of the buildings had improved significantly since they were reported on in the 1999 Inspection Report. Approximately 800 tonnes of scrap material had been removed from Bellingshausen within the past five years. In addition the administrative/living quarters had been recently repainted and their interior extensively refurbished to a high standard.

The most distinctive addition to Bellingshausen has been the construction of a traditional Russian Orthodox church (the Church of the Holy Trinity) on top of the steeply elevated ridge to the north of the station. This wooden building, made of interlocking cedar logs was completed in January 2004, and is described in ATCM XXVII/IP45.

Personnel

The 26 staff present (all civilian) included nine scientists, of whom five were ecologists from a German university. The Inspection Team was informed that the position of Station Leader was either held by the doctor or radio operator, the latter being in charge at the time of the Inspection.

Support staff included a cook, doctor, diesel engineer and two technicians. A Russian Orthodox priest, who also performed the duties of station carpenter and assistant cook, was also resident.

Both the current and incoming Station Leaders had considerable Antarctic experience, having completed four or five winters each.

Two members of the environmental NGO “Mission Antarctica” were present on the base and more were due to arrive shortly. In cooperation with the Russian Arctic and Antarctic Institute this group was scoping the removal of some of the bulk fuel tanks.

Scientific Research

As was indicated in the 1999 Inspection Report, Bellingshausen closed its upper atmospheric physics programme early in 1999 and removed the associated hydrogen generating and balloon launching facilities. In addition, the aerological programme, which possessed a long data record of soundings was discontinued, with the ground station apparently transferred to Novolazarevskaya. The closure of these programmes has reduced significantly the amount of research being conducted at Bellingshausen. There are now no specialised laboratory facilities on the station. The science programme is confined largely to certain ecological studies: e.g. investigating Skua feeding biology, disturbance to breeding Giant Petrels from overflights and botanical mapping of nearby Ardley Island (ASPA No. 150). A study of airborne pollen and spore transport, and analysis of the ice cover of the Peninsula/Weddell Sea area from remote sensing, were also being undertaken. Two GPS operators were present, and the outside meteorological station was linked to a well-appointed meteorological office.

Logistics

Fuel is delivered every 2-3 years by a Russian resupply vessel, and pumped ashore to the bulk tanks in Rocky Cove 3.5km to the north east of the station by a 200 metre floating hose. This is blown through by compressed air after fuel transfer.

A fixed, elevated 100mm steel pipe of about 400 metres length connects the hose to three large single-skinned, unbunded tanks of approximately 250,000 litres each. These were scheduled to be emptied and cleaned in April 2005 by a specialist prior to the arrival of the fuel resupply. One of the three tanks is leased to Uruguay to support the nearby Artigas station. Three similar tanks had been cleaned and prepared for demolition and removal during 2005.

A further three tanks of similar construction but approximately 150,000 litres capacity were located at the north of the same beach: one is to be removed. The other two contain waste and recovered petroleum products. This bulk fuel storage facility was constructed in 1970/71 to supply the then Soviet Antarctic fishing fleet.

Fuel is delivered from the bulk tanks to the station by a tanker-truck, over a rough 3.5km track. This truck was out of service at the time of the Inspection. A tank of around 2,500 litres capacity has been fabricated on station to be fitted to a six-wheeled all-terrain truck as a replacement.

One of the large (250,000 litre) bulk fuel tanks at Rocky Cove, North of Bellingshausen.

From the truck, fuel is pumped into four holding tanks 20 metres to the east of the powerhouse, one of 50,000 litres, two of 20,000 litres, and one of 25,000 litres. These appeared to be in good condition, and are elevated on concrete plinths contained within a shallow 100mm bund. This was however penetrated by a 50mm open drain pipe. The tanks are bottom-fed and connected through an adjacent pump house via underground pipe to the 1,000 litre day tank in the powerhouse.

Power is supplied by two 125KvA diesel generators and one of 60KvA. A further 60KvA standby generator is located in the emergency power house. There is no exhaust heat recovery, emission treatment, or monitoring. Bellingshausen currently consumes around 122,000 litres of marine diesel every year in the powerhouse and vehicles.

The station is resupplied, generally by the M/V *Akademik Fedorov*, every 2-3 years. Supplementary supplies of fresh food and priority items arrive by air through Marsh station every two months from September to April.

Water is plentiful. It is drawn from a man-made dammed pond near the powerhouse, on the meltstream that flows from Lake Kitezk, 500 metres northwest of the station. It is heated in the generator building, and piped as required, usually weekly, to holding tanks in the station buildings via a 100mm elevated steel pipe. Consumption is around 18,000 litres per week, averaging 100 litres per person/day.

Aside from fuels, oils and lubricants, the Inspection Team observed no significant amounts of hazardous chemicals on the station, due largely to the previous decommissioning or removal of laboratory facilities.

Transport and Communications

The station had numerous plant and vehicles including a small four-wheel-drive car, a 4-tonne crane, a large bulldozer (around Caterpillar D8 equivalent), two snow-mobiles, a 7-tonne backhoe, and several large multi-wheeled or tracked all-terrain vehicles. An 8-seat mini-bus belonging to King Sejong Station and used by Korea for airfield transfer is stored in the garage.

Bellingshausen has an aluminium landing barge of approximately 15 metres length. This was anchored in the bay and is used periodically to support the activities of other stations in the area (King Sejong, Great Wall, Frei and Artigas) as well as Bellingshausen itself. A 6-person outboard-powered inflatable was also on the beach.

Aircraft movements at Bellingshausen are limited to a few helicopter landings per season. These generally use the helipad at Frei, although there is ample space for landing large helicopters around Bellingshausen itself.

Bellingshausen was once a major hub for Antarctic HF communications and a principal clearing house for Antarctic meteorological observations. It is now equipped with Inmarsat C supported by a limited HF capability and VHF in the marine and aircraft bands.

Safety, Training, and Emergency Procedures

The station includes a surgery staffed by one medical officer (surgeon). This includes a 2-bed ward and facilities for dentistry, surgery, x-ray and physiotherapy. This was built during the time that Bellingshausen supported 40-50 wintering staff. The Medical Officer is unassisted. Medical casualties could be evacuated through the adjacent Marsh airfield (Chile).

Wintering Bellingshausen personnel undertake SAR training prior to departure for the station.

The station has no networked fire or smoke detection system. However the Station Leader informed the Inspection Team that detectors, alarm panel and associated equipment were aboard the resupply ship, due in April. Occasional fire-emergency practices are carried out.

The Station Leader also informed the Team of some instances where Bellingshausen had assisted other stations in the area during emergencies, and when stations in the area had cooperated on an ad hoc basis. There appears however to be no formalised SAR or emergency plan for the Maxwell Bay area to draw on pooled resources and expertise.

Environmental Management

The Station Leader was familiar with the provisions of the Environmental Protocol. These were contained in the Environmental Management Plan for the station.

Waste Management

The most noticeable and major improvement at Bellingshausen was the removal of approximately 800 tonnes of waste scrap metal. This, as well as a significant quantity of waste oil, had been shipped out in 2002 with the considerable assistance of the UK-based NGO, *Mission Antarctica* (see ATCM Information Paper XXV/IP16).

The Inspection Team was shown around the extensive waste processing building. This housed a large, diesel-fired incinerator (type unknown), a waste food-drying facility, and an HSM waste compactor which is no longer in use. The Team was informed that the incinerator burns at approximately 1,000°C, and is used once a month during the winter, and once every three weeks in summer, to burn paper, wood and dried food waste. Time did not allow for a visit to the waste storage building, which, it is understood, is located some distance from the main station.

Sewage and grey water is macerated, piped into a holding tank, and then discharged directly into the freshwater stream which runs past the station. The Team learnt that a new, containerised sewage treatment plant might be installed at Bellingshausen. This initiative, which would prevent untreated sewage being discharged into the freshwater stream leading directly to the nearby beach, is welcomed.

Environmental Impact Assessment

The Team understood that the Station Leader was responsible for assessing the environmental impact of activities at Bellingshausen, and obtaining prior permission from the relevant Russian Government agency. No formal, written EIAs were made available to the Inspection Team.

Protection of Flora and Fauna

The Station Leader is responsible for giving verbal briefings to all staff on the protection of flora and fauna. No guidelines or other information leaflets were posted on notice boards, although such material had been requested from the Russian Arctic and Antarctic Institute.

A survey of fauna in the surrounding area, including Ardley Island, was being undertaken by German and Russian scientists. Vegetation maps were being prepared, based on floristic surveys.

Human impact studies included investigations into the impact of Marsh air operations on the breeding success of Giant Petrels, and studies into the feeding habits (specifically scavenging of station food scraps) by Brown Skuas.

No controls measures are in force to prevent the introduction of non-native species. Of concern was the newly built church, constructed out of untreated cedar logs. The Inspection Team was also surprised to see herbs and house-plants growing at the station. It was not clear whether these were subject to permits.

Pollution Prevention and Control

The Team was shown an environmental emergency plan which included details of spill prevention. It was understood that 150 metres of inflatable oil spill booms are shared with Artigas Station (Uruguay).

Protected Areas

A Russian text of the Management Plan for ASPA 150, Ardley Island, was held on station and shown to the Inspection Team. As in the joint UK/Germany Inspection report of 1999, the Team noted that the extensive tracks and bulk fuel tanks to the east of the station are within the northern sub-site of ASPA 125, Fildes Peninsula.

Much of the environmental survey work mentioned above was being undertaken on Ardley Island. The visiting German scientists confirmed that they had been issued with permits by their relevant national authority to enter this protected area.

Tourism

Bellingshausen had received nine cruise ship visits so far this season, with a total of approximately 600 visitors coming ashore. Further tourists had visited from the hostel at Marsh. No written procedures are in place for tourist visits. Generally, tourists visit the administrative offices and the Holy Trinity Church. Smaller vessels generally request permission by VHF to land passengers at the station approximately 2 hours before arrival. Vessels of greater than 100 passengers give several days notice.

Summary

The Inspection Team was impressed with the extent of the cleanup activities that have taken place at Bellingshausen since the 1999 Inspection, and the continuing efforts by the RAAI, the Station Leader, and personnel to bring the station's facilities up to a modern and environmentally compliant standard.

The Team also noted the degree to which Bellingshausen and its personnel support the activities of other stations in the area, including the use of the station's fuel storage, barge, fuel-spill boom, and boating expertise.

Bellingshausen is now a much smaller station, in terms of personnel, than was previously the case. The result is considerable overcapacity of buildings, some of which appear to be largely empty or redundant. Rationalization of the station's infrastructure would therefore be a useful exercise. The removal of the previous upper atmospheric physics programme in 1999 significantly reduced the scope of scientific activity at Bellingshausen. Science programmes and facilities should be reviewed to enhance the station's effectiveness.

Recommendations

The Inspection Team, whilst acknowledging the major resource implications, nevertheless recommend that:

- Consideration should be given to the removal of the bulk fuel farm at Rocky Cove. An appropriately bunded fuel farm within the station complex itself would likely better meet the station's future fuel requirements;

- An assessment should be carried out of the apparent overcapacity of storage and garage facilities, with a view to rationalising the station's infrastructure, if appropriate;

- The science programme at Bellingshausen should be expanded, and appropriate laboratory facilities provided;

- A waste compactor should be installed to reduce the volume of waste for shipping and disposal.

JR, MR, TM, RD

GREAT WALL STATION (PEOPLES' REPUBLIC OF CHINA): Inspected 15 February, 2005

Introduction

Great Wall Station is situated at Lat. 62° 13' S; Long. 58° 58' W in the western sector of Maxwell Bay, King George Island, south of Ardley Island. The station was established on 20 February, 1985. The station is operated by the Chinese Arctic and Antarctic Administration (CAAA) with responsibility for scientific research lying with the Polar Research Institute of China (PRIC).

The station covers an area of 0.7 km^2 and is about 10 – 15 metres above sea level. The general ground surface of much of the station area is medium sized rounded cobbles. Great Wall is accessible by track from the nearby Chilean station of Frei, which lies approximately 2 km to the north.

Physical Description

The station consists of around twelve major buildings with several minor structures such as stores and shipping containers. The arrangement of the station was generally as described in the 1999 UK/Germany Inspection Report, with some notable differences.

What had previously been the infirmary/recreational building, just to the north of the main accommodation block, had been removed. In addition, the former power generator building had been demolished and a new extensive, well appointed power plant erected in its place. A shipping container located between the pier and the main bulk fuel tanks, previously used as a marine biology laboratory, was now semi-derelict.

The buildings at Great Wall fall generally into three categories:-

- The original steel clad structures. These include accommodation buildings number 1 and 2, the laboratory, communications and meteorology buildings;

- Metal clad buildings added in the early 1990's such as the food store and the large garage/workshop;

- Modern structures, notably the main accommodation block with comfortable facilities and the new 'state of the art' generator power house.

A schematic map of Great Wall Station. The main fuel farm is to the left of the picture. The large blue building is the newly constructed generator house. The green building, formerly the Infirmary/Recreational rooms, has since been removed.

Most, if not all, of the original buildings were showing extreme signs of corrosion and decay to the point that their structural integrity might be affected. The elevated concrete pier foundations of these buildings were severely decayed with, in some instances, the interior reinforcing rods completely exposed and the concrete crumbling. The external metal surfaces of these buildings were also very heavily corroded and the roofs in some buildings were no longer water-tight.

The Inspection Team was informed that five of the older buildings were due to be demolished and removed from the station, possibly in 2007. These included the old garage, laboratory, communications and meteorological buildings and accommodation building number 2. The intention was to replace the functions of some of these buildings with a new multi-purpose building on the site of Accommodation Building No. 2.

Apparently the plan for Building No. 1, the original station building constructed in February 1985, is to preserve it as a commemorative structure. If this is so, then considerable effort will need to be spent on dealing with this building's corrosion problem if it is not to deteriorate further.

Personnel

At the time of the Inspection 18 personnel were present on the station. These included five scientists, two meteorologists, a cook, a doctor, five engineers, the Station Leader and his deputy. The station was due to reduce to a wintering complement of 12 at the end of February 2005. Personnel at Great Wall spend one year on the station, arriving in December normally through Marsh station (Chile). The number present on the station was well below its carrying capacity of 50-60. Most personnel were housed in the main

accommodation block which has 18 double-berth rooms, with further space provided in the original station building (Building Number 1), and the radio communications building.

Science

Scientific research appeared to be rather limited in scope, with laboratory facilities that fell below the quality of some other buildings on the station.

Five scientists were present: one marine microbiologist, an ornithologist, and three geologists.

The laboratory building was one of the original steel clad buildings on the station and along with all other structures of a similar age was showing considerable deterioration. The external painted surfaces have suffered extensive and severe corrosion, whilst the elevated concrete piers which support the building were seriously decayed.

Five laboratories and two store rooms were present in this building. All were of similar quality and not extensively equipped. The building was unheated and showing signs of damp. The Inspection Team was informed that this building was one of those scheduled for demolition, prospectively in 2007.

Three small seismology buildings which were not inspected lay on elevated ground to the south of the station.

To the north, and adjacent to the track to Frei Station, lay a fenced-off meteorological station, linked to a well-equipped met office. From here, data were passed to Frei station. A differential GPS base station was housed close by.

There is considerable potential to improve scientific research at Great Wall Station.

Logistics

Power is provided by three 128 kW Volvo Penta generators which are run in rotation. These are located in the new powerhouse which also houses well appointed recreational rooms and a laundry. Potable water is pumped directly from the lake (5m deep) to the west of the station, and just behind the powerhouse. This source provides a plentiful year-round supply. Water is filtered in the powerhouse and stored in four stainless steel tanks (two hot and two cold) before being pumped elsewhere around the station.

Great Wall Station has a storage capacity of 480,000 litres of marine diesel in tanks located in two fuel storage areas. Eight 50,000 litre cylindrical tanks are situated on a hill to the south of the station and a smaller tank farm at the rear of the powerhouse contains 3 x 20,000 litre and 4 x 5,000 litre tanks. All tanks are single-skinned, not bunded, and in varying states of corrosion.

The recently constructed generator building.

Most tanks in the powerhouse fuel farm were supported on wooden sleepers, although one tank was resting directly on the gravel in a melt pool which drained through the station.

In all, fuel is handled five times between the supply ship and its consumption for power generation. It is transferred from the resupply vessel to a barge (which was not present on the day of the Inspection) and then pumped up-hill to the main fuel farm through a 100mm lay-flat hose of about 400 metres in length. The lower 30 metres of this hose was capped and loosely piled on the gravel shore with numerous kinks. Fuel appeared to be present in the lower end of the hose for a length of around 200 metres and the Inspection Team estimated that it contained some 600 litres of fuel.

The lay-flat hose enters a pump house (20' shipping container) before being directed through bottom-feed pipes into the bulk tanks. Various rubber or synthetic fuel hoses enter or leave the pump house through jagged holes roughly cut in its walls. Some of these hoses were cracked and frayed. There was extensive evidence of fuel leaks or spills within the pump-house and in the surrounding gravel, although no evidence of leakage from the tank valves.

Fuel is transferred from the main tank farm to the powerhouse tanks by a tip-truck with a 2,000 litre tank mounted in the back. It is pumped into the powerhouse tanks through a 100mm rigid rubber hose and from there to the powerhouse day tank via a 50mm rigid rubber hose. The connection and valve at this point appeared to the Inspection Team to be fragile and vulnerable to damage.

The powerhouse bulk tanks were corroded and had no protection to their bottom-draining valves. There was extensive evidence of fuel spilled or leaked in the surrounding soil and melt pond.

Transport and Communications

At least 8 vehicles are held on the station, including 2 Caterpillar 950s, a D5 Bulldozer, a new 16 tonne crane, a skidoo, a tracked *Kässbohrer* flexmobile, a 4 x 4 Toyota, a jeep and a fuel truck with a capacity of approximately 6,000 litres. Two single-engine 16-person Zodiac inflatables are also held at Great Wall Station.

This station has an $8m^2$ concrete block helipad. The pilots supporting the Inspection Team found it poorly marked.

Communication systems include VHF and HF radio, e-mail, Iridium satellite phone and an internal base telephone system.

Safety, Training and Emergency Procedures

Staff at Great Wall Station attend an extensive one month long training programme in north-east China before being deployed to Antarctica. Subjects covered include safety, survival, fire-fighting and environmental protection.

Fire-fighting exercises are carried out once during the summer period and once in winter. All buildings appeared to be well equipped with fire-fighting equipment.

Little was ascertained by the Inspection Team of the search and rescue capability, although presumably the Zodiacs could be used for incidents at sea. Medical evacuation would be undertaken by vehicle to Marsh runway for onward transfer to Chile.

Environmental Management

Generally, the staff that accompanied the Inspection Team were familiar with the provisions of the Environmental Protocol.

<u>Waste Management</u>

Waste management at Great Wall is co-ordinated by the resident doctor. Most wastes were well secured and stored indoors to prevent their dispersal into the environment. Concrete pillars and founds from the dismantled generator building were arranged neatly by the old garage awaiting removal. All waste, apart from sewage, grey water and general incinerable waste (e.g. kitchen waste) are removed every two to three years for disposal in China. A small waste compactor was located in the garage, and is used for waste aluminium/steel drinks cans. These are returned to China for recycling.

A twin-chamber 400 to 500°C incinerator is housed in a small building on the shore, to the east of the main station complex. The Team was informed that this incinerator will be replaced in the near future. Adjacent to this building, a marine-style chemical sewage treatment plant is located. Solid treated sludge is incinerated, and treated liquid waste is discharged via a rock-armoured short pipe to the intertidal zone. A second, disused GOLAR marine incinerator is also located in this building.

Environmental Impact Assessment

The Deputy Station Leader was clearly familiar with the requirements for EIA. An Initial Environmental Evaluation (IEE) had been undertaken for the new generator building, which had been commissioned in February 2002. It was unclear whether this IEE had addressed the significant earth levelling above the beach on the eastern side of the station.

Protection of Flora and Fauna

The Inspection Team was concerned to note numerous deep vehicle track marks through moss beds at the south of the station.

Pollution Prevention and Control

The Inspection Team was concerned to note that some of the main fuel tanks showed evidence of fuel weeping from cracked or corroded welds, and the supporting concrete pillars and footings were heavily eroded and crumbling. Small concrete troughs constructed as bunds beneath the tank valves and outlet pipes were all cracked or broken.

The bulk refuelling lay-flat hose was stored outside, kinked and contained an estimated 600 litres of fuel. Equally disturbing was the heavily contaminated soil surrounding the fuel tanks located behind the power plant.

The Team was informed that chemical dispersant is held on station for use with marine spills. No other oil spill response equipment is held at Great Wall Station, although an Oil Spill Contingency Plan had been prepared.

Paint–contaminated rock and pebbles was also evident around many of the buildings.

Tourism

More than 100 tourists had visited Great Wall this season, in small groups overland from Frei station. No tourist vessels had landed passengers at the station. A small gift shop and a newly established post office is located in the main accommodation building.

Summary

A medium-sized permanent station consisting of buildings of variable age and condition. The most recent buildings are of high quality and include the main accommodation block housing the lounge, kitchen and bunkrooms.

The replacement of the former generator plant with a new “state of the art” power generating facility (which also houses the fresh water storage tanks, laundry and recreational facilities) is to be highly commended. It addresses one of the major concerns set out in the 1999 Inspection Report (UK/Germany)

However, other matters which were drawn attention to in that report have yet to be addressed. Most importantly, the whole fuel supply and fuel holding practices at Great Wall need critical attention. Given what must have been a considerable investment in the

new power plant, it was not clear to the Inspection Team why closely-related fuel storage issues had not been addressed at the same time.

The Team was of the view that urgent consideration should now be given to the replacement of both the ageing bulk fuel tanks and the holding tanks adjacent to the generator plant. The practice of routinely trucking fuel from one set of tanks to the other should also be reviewed.

All of the older original buildings of the station are now showing considerable deterioration including severe corrosion to external metal cladding and decay of the buildings' concrete foundations.

The Team was therefore pleased to learn that steps are already in hand to demolish these buildings within apparently 2 years, and to accommodate the same facilities within a new large building on the site of the original accommodation block No. 2. Such a significant development of Great Wall is to be welcomed. It will provide the station with modern facilities.

It is hoped that, at that time, a more comprehensive science programme will be initiated in new purpose-built laboratories.

Recommendations

- The Inspection Team was of the opinion that a more focused and comprehensive programme of science could be achieved at Great Wall Station;

- As a matter of urgency, fuel transfer procedures should be reviewed, and a condition survey of all bulk fuel storage tanks undertaken, with a view to providing safer storage facilities, appropriate spill containment and response equipment;

- Greater emphasis on building maintenance would enhance the useful lifetime of the buildings, and ensure they remain fit for purpose. The Inspection Team welcomed the proposed intention to dismantle and remove five of the redundant and/or dilapidated buildings, and replace them with new facilities.

JR, TM, MR, RD

ST KLIMENT OCHRIDISKI (BULGARIA): Inspected 21 February, 2005

Introduction

The summer-only station St Kliment Ochridiski is located at Lat. 68° 38' S; Long. 60° 21' W, on a small saddle on Hurd Peninsula, 150 metres behind South Bay, Livingston Island. During summer a small melt-stream runs from the glacier behind the station to the sea. The 800 metres shoreline below the station is exposed to the prevailing south westerlies and constant, frequently heavy surf. The Spanish station Juan Carlos I lies 1.7 km to the south-west.

Opened in 1988, the station is administered by the Bulgarian Antarctic Institute and financed by the Ministry of Foreign Affairs.

The station was opened for the 2004/05 summer in late November 2004 and was due to close within a week of the Inspection. St Kliment Ochridiski was last inspected in 2001 by the USA and prior to that by the UK /Germany in 1999.

The aerial view of St Kliment Ochridiski. The main station building is left of centre, an array of solar panels in front. The two "Parcol" shelters can also be seen.

Physical Description.

The station's seven buildings are located on a ridge 20 metres above the beach. The original station living hut of 3.5 x 6 metres was built in 1988 and is steel-framed and clad in sandwich-panel, providing great thermal efficiency. It is now used as the communications centre and also has overflow accommodation for five. Adjacent to this is a 2.5 x 4 metre wooden-clad container used as a store for food, emergency equipment and other supplies.

Two portable arch-frame "*Parcol*" shelters of 8 x 4 m and 4 x 2 m respectively house an inflatable rubber boat and associated gear, and provide potential extra accommodation. The main station building is of sandwich-panel construction clad with prefabricated concrete panels, and is approximately 12 m by 5m, with food storage in a rock-walled subfloor area. This building includes a sizeable kitchen/dining area, bathroom, clinic, and two bedrooms of four bunks apiece with some limited desk space.

Power generators are housed in a steel-framed and metal clad shelter 4 x 6 metres, to the south of the main building. A small A-framed shelter which serves as a chapel in summer and a snowmobile store in winter, is located 300 metres behind the station.

Personnel

A feature of St Kliment Ochridiski, particularly appropriate to smaller stations, was the multi-tasking of personnel. The seven-person complement included a Station Leader/mechanic, a doctor/field rescuer, a radio-operator/technician, and a geologist/boatman. The group was completed by a Bulgarian biologist, and two visiting German scientists from the Alfred Wegener Institute.

Scientific Research

The biologist, a senior member of the Bulgarian Academy of Sciences, was studying the morphometrics and genetic diversity of Gentoo penguins. Blood samples were collected from a small colony 1.5 km distant, for subsequent DNA analysis in Bulgaria. As part of a joint programme with Vernadsky station (Ukraine), subcutaneous electronic tags were being used to track penguin movements.

The AWI microbiologist was undertaking comparative studies of soil microbiology with sites in Siberia, and adaptation of micro-organisms to severe climate conditions. The AWI geomorphologist was studying permafrost layers and discontinuities in the glacial forefields, using ground penetrating radar.

The station does not possess laboratory facilities. This largely restricted the science undertaken to sampling and storage, more detailed analyses were then undertaken subsequently, in Bulgaria (or Germany).

Logistics

Supplies for St Kliment Ochridiski are delivered from Bulgaria to South America, or purchased there, for onwards delivery with the assistance of the Spanish Antarctic programme using their vessels *Las Palmas* and *Hesperides*. Additional support for transporting personnel and supplies had been provided in the past on an *ad hoc* basis by Chilean, Uruguayan or tourist vessels. Supplies are landed on the beach by inflatable boats, and transferred from there to the station by snowmobile and trailer.

Water was drawn from a small meltstream at the base of the glacier 300 metres behind the station, and gravity-fed through a 50mm poly-pipe to the main accommodation building.

The station's electrical power is supplied by one of three generators (24, 18, or 22 kW) housed in a makeshift 6 x 4 metres steel-framed metal clad shelter, constructed in 2000. This is located 30 metres to the south of the main building. Fuel consumption is minimised by running only one generator at a time and only for four hours in the morning and four in the afternoon/evening.

Fuel consumption per season was 3,000 litres of diesel. Fuel was stored in 205 litre drums next to the generator shed and hand-pumped into two 500 litre steel header tanks. These were on steel supports 1.2 metres above the ground, and fitted with steel spill trays of around 200 litre capacity. Both trays were however full of water. Fuel is gravity-fed to the generators.

Fuel spillage was evident in the area around the fuel storage and generator shed, with patches of diesel-stained ground. That said, the power generation arrangements were a considerable advance on those reported in the 1999 Inspection Report. The previous generator was awaiting removal from the station along with its concrete housing.

The station's power supply was augmented by 0.5kW supplied by an array of 8 solar panels of around 1.2 x 5 metres area, erected immediately in front of the accommodation building.

Emergency power could be provided by one of two petrol generators (4 or 6 kvA) located in the storage building.

Transport and Communications

Local transport is provided by two snowmobiles and an aluminium sledge for work on the adjacent glacier and transport of supplies from the beach when that route is snow covered at the start of the summer season.

Two inflatable boats (Mk II and Mk III Zodiacs) powered by single 25 or 30 horsepower outboard motors were also present. The exposure of the beach below St Kliment Ochridiski to the prevailing westerly winds and at times heavy surf may make launching and retrieving the boats hazardous. The south-westerly end of the beach offers better shelter.

There is no helipad on the station, but the Inspection Team's *Lynx* helicopter was able to land on the gravel beach some 30 metres from the accommodation building.

Communications were available on HF and VHF bands, with a 2kW HF transceiver giving direct 24 hour contact with Sophia, Bulgaria. A main and secondary mast located adjacent to the communications building supported two aerial arrays. These are removed at the close of the summer programme to avoid damage during winter.

Safety, Training, Emergency Procedures

Emergency response capability is limited. However, the station's medical officer was qualified in, and equipped for, mountain rescue, and the inflatable boats and skidoos were also available. An emergency store contained food, skis, some spare domestic supplies, and two emergency generators. Two recent medical cases had been evacuated from St Kliment Ochridiski with assistance from the nearby Spanish station Juan Carlos I.

None of the station buildings was fitted with smoke or fire detectors. There were however fire extinguishers in some buildings. The station had sufficient extra accommodation for at least 10 in an emergency.

Environmental Management

The main buildings of St Kliment Ochridiski cover an area of some twenty metres by fifty, with a small area on the beach where materials for retrograding are stored, and the chapel 300 metres up the hill. Aside from field activities, operations are mostly confined within the station area.

Environmental Impact Assessment

The station personnel did not appear to be aware in any detail of the EIA processes of the Environmental Protocol. There was no monitoring of environmental parameters to detect changes brought about by human activities at the site, though this was in a generally tidy condition.

Conservation of Flora and Fauna

There are some well-vegetated areas near the station, the most at-risk from human disturbance being marked off. A small colony of Gentoo penguins nearby is the subject of a research project. The risk of the activities of the station significantly impacting on the local environment was considered low. The Team did not see any posters, guides or local maps displaying local environmental information. However, given the small station complement, such knowledge is likely to be adequately passed by word of mouth.

Some disturbance of the penguin colony occurs through the taking of blood samples and the insertion of subcutaneous transponder chips. This work was however being done under permit.

Waste Disposal and Management

Sewage and domestic liquid wastes are discharged through a flexible pipe directly into a snow-covered gully some 20 metres to the side of the main accommodation building. From here, it flows beneath the snow to the beach and percolates through the rocks into the foreshore. All other wastes are sealed in fuel drums and removed for disposal in Ushuaia, Argentina.

Burning of wastes in used fuel drums, as reported in the 1999 Inspection report, has been discontinued. Some components of an incinerator building were onsite to be assembled in the 2005/06 season. At the time of the Inspection, the prospective incinerator was in Ushuaia, Argentina awaiting delivery.

Tourism

St Kliment Ochridiski had received no tourist visits so far this season and was expecting none.

Summary

A modest summer-only station, but one which has seen considerable expansion and improvement since it was last inspected in 1999. This is particularly so in the areas of

power generation, and added storage and accommodation in the form of the *Parcol* shelters. Further developments are planned to improve accommodation and waste management facilities. Despite the lack of laboratory facilities, science is the key rationale for the station and it was commendable to see the degree of international scientific collaboration being undertaken despite the rudimentary facilities.

The construction of dedicated laboratories of even a moderate scale at St Kliment Ochridiski would enhance its capability for scientific research considerably.

Interest within Bulgaria in its Antarctic programme is evident at the highest levels of Government, with a recent visit to St Kliment Ochridiski by the President, Foreign Minister, and Vice Foreign Minister of Bulgaria. It is hoped that such political attention may be translated into an increase in resources for the Bulgarian Antarctic Institute and the operation of its Antarctic station.

Recommendations

- That consideration be given to the provision of dedicated laboratory facilities;
- That the current practice of discharging grey water and sewage directly into an adjacent snow drift should be discontinued, and better waste-water arrangements be instigated without delay;
- That more attention should be paid to fuel handling to reduce the risk of spillage. This should include more efficient drip trays or bunding and clearly defined procedures for fuel-pumping operations.

MR, TM

JUAN CARLOS I (SPAIN): Inspected 21 February, 2005

Photovoltaic panel banks at Juan Carlos I.

Introduction

Juan Carlos I was established as a summer-only station in 1988 on Hurd Peninsula, Livingstone Island, at Lat. 62° 39'S; Long. 60° 23'W. It is operated by the Spanish Ministry of Education and Science. The station sits in a floristically rich valley, stretching from the shoreline approximately 100 metres inland. The Bulgarian station St Kliment Ochridiski is 1.7 km to the north-east.

The station was last inspected in 1999 by the UK and Germany. Prior to that, it was inspected in 1993 by the UK, Italy and Korea, and in 1990 by Chile.

Physical Description

The station layout has changed little since the Inspection of 1999. It comprises a main accommodation and living quarters, a scientific laboratory, and two rows of containerised storage buildings, as well as an aluminium building to house the incinerator. Three fibreglass igloos, one of which had been newly installed this season, are used as overspill accommodation. A further four–person accommodation igloo was in the process of being erected. In total, there are 17 buildings. Ten of these are containers. A compacted fractured-rock track marked with cobbles runs through the station down to a boatshed at the north-eastern limit of the station.

Most of the buildings were built in 1987/88, and some are starting to show their age. In particular, the laboratory was felt to be in need of better insulation, and external paintwork is flaking off many of the buildings. Options for replacement or renovation of the station's buildings are being investigated. This year, Spain's General Director of Research had visited the station to evaluate the suitability of its facilities.

There are two field huts associated with the station, one at Hurd Glacier, the other at Radio Peak.

Personnel

At the time of the Inspection, there were 14 civilian staff at the station. Of these, four were scientists, one of whom was Russian. Usually, the station accommodates 7 to 9 scientists. Four biologists had recently transferred to Gabriel de Castilla Station, Deception Island, and two scientists were due to arrive in the following days.

Earlier in the season, the station numbers had risen to 27. Interestingly, the Team was informed that the limiting capacity of the station is the sewage treatment plant. This was designed for an average of only 12 people.

Scientific Research

Juan Carlos I maintains a comprehensive programme of science. This compliments the science carried out at Gabriel de Castilla. It includes glaciology, geomagnetics (three magnetometers are permanently situated on the hill to the south of the station), as well as the geology of South Bay, and geodesic and geophysical science. Biology concentrates on intertidal communities, pelagic eco-systems and limnology.

The main science facility includes a multi-use biology/chemistry laboratory, an ionospheric laboratory, a library and a meteorological room.

Logistics

Annual resupply is once a year via the Spanish naval vessel *Las Palmas*. Cargo and personnel are transported ashore in small boats. Logistic assistance is also provided to the Bulgarian Antarctic Institute.

Fuel transfer is achieved by pumping directly from *Las Palmas* via a 32 mm abrasion-resistant floating rubber hose. This is fitted with dry–break valves. Polar Diesel is transferred at the rate of 3,000 litres per hour. The process is supervised both at sea and on land. Once pumping is complete, the hose is emptied by compressed air. This method of fuel resupply is only carried out when sea state and ice conditions allow, otherwise fuel is brought ashore in 205 litre drums. The maximum quantity of fuel held on the station is 23,000 litres of Polar Diesel in bulk, and 1, 400 litres (seven drums) of petrol.

The main fuel farm is located to the north of the station. It comprises four tanks (three 6,000 litre steel tanks and a 5,000 litre fibreglass tank). All are single-skinned, bottom fill and draw tanks. Only the areas beneath the valves are bunded.

Additionally, there are four small day tanks (estimated at two 200 litre and two 100 litre) fixed to the wall of the generator container, and one 700 litre plastic tank installed in the incinerator building. Fuel is pumped into these from the bulk fuel farm via a rubber fuel hose laid on the ground surface. This is protected with a metal guard where it crosses the track, but elsewhere it is unprotected.

Power is supplied by two containerised 37 KvA Deutz generators. These are used alternately every 10 days. The annual fuel consumption is approximately 13,000 litres.

Three portable generators (one at 20 KvA, one at 30 KvA and one at 8 KvA) are also available for emergency power generation. In addition, there are two photovoltaic panel banks, one providing 1kW and another 2kW. There are also 2 Bournay Inclin wind generators, one of 1.5kW and one of 3kW. These provide year-round power to the meteorological station and the magnetometers.

Water supply from the melt stream that runs past the station is excellent. Water is pumped to a holding tank where it is constantly circulated to prevent it from freezing. Water for human consumption is passed first through a standard kitchen filter. As a back up, there is a lake 200 metres behind the station.

Transport and Communications

The vehicle fleet at Juan Carlos I consists of a *Polaris* 6 x 6 ATV, a 300 kg *Terri* tractor/crane, and four *Bombardier* snowmobiles.

There are also five Zodiacs inflatables: two Mark V (with a Yamaha 45 or 50 hp outboard), two Mark III (with a Yamaha 30 hp outboard) and one Mark II (also with a Yamaha 30 hp). A modular plastic floating pontoon, approximately 7 –8 metres long, is also available for use when conditions allow. This can be moored adjacent to the boat house.

Two basic helipads are present. They comprise a circle laid out in boulders. They are not marked with the usual 'H' symbol.

The communications centre is located in the main station building. Facilities include 3 Inmarsat telephones, two Iridium phones, internet connection, five HF radios and 18 VHF radios.

Safety, Training and Emergency Procedures

Fire-fighting measures at Juan Carlos I were some of the most comprehensive witnessed by the Inspection Team. The station has a fire emergency plan which they practice at least every 2 months. Equipment includes a 5,000 litre water flubber, with firefighting hoses and a foam hose, electronic alarms throughout the main building, and full breathing apparatus located at strategic points around the station.

Pre-deployment training had been provided for the logistic staff in Spain, for example in fire-fighting, sea survival and first aid, and one base member had attended the British Antarctic Survey/Oil Spill Response Ltd. Antarctic Oil Pollution Control Course. However, staff were clearly of the opinion that their pre-deployment training could have been wider-ranging. For all but two of them, this was their first season in Antarctica.

The medical facility is very limited. It occupies the end room in the laboratory building, approximately 3 x 2 metres in size. Nevertheless, it is well stocked with medical supplies and a defibrillator, but has no X-ray facilities. A contingency plan for medical evacuations had been prepared.

Glacier and mountain SAR cover is provided by trained mountain rescue guides. Marine SAR covers the South Bay only, involving the station's boats.

Environmental Management

The Station Leader considered environmental issues to be of paramount importance, and a high level of awareness was apparent amongst the station's personnel. Documented procedures were extensive and excellent.

Waste Management

Waste management is guided by the Station Waste Management Plan. Most wastes are separated at source, deposited in colour-coded bins, safely stored inside containers, and returned to Ushuaia, Argentina. The Station Leader shared the concerns expressed also at Gabriel de Castilla, as to whether the segregated wastes were in fact sent for recycling. Only organic wastes (e.g. food waste) is incinerated in a twin chamber 700-1,300°C incinerator. The ash is removed from Antarctica. Detailed records are kept of the quantity and type of waste produced at the station.

Sewage and grey water treatment is by a two-stage, four chamber aerobic digester, with charcoal filtration of treated water before discharge into South Bay. Weekly water quality sampling and analysis is undertaken for temperature, pH, conductivity, BOD, COD, nitrates, ammonium, phosphates and suspended solids. The solid sludge is removed to Punta Arenas, Chile or Ushuaia, Argentina.

Environmental Impact Assessment

The Station Leader was aware of the requirements for EIA. Two assessments had been prepared for this year's campaign, to cover field work on the Byers Peninsula, and ICEPOS laboratory-based work.

Protection of Flora and Fauna

Recommendation XVIII-1 and other information posters were displayed prominently in the main accommodation building. Three areas of vegetation in the station environs are roped off to prevent pedestrian access.

Pollution Prevention and Control

An Oil Spill Contingency Plan has been prepared for Gabriel de Castilla. Significant quantities of absorbent booms and pads are stored at the station.

Protected Areas

The nearest protected area to Juan Carlos I is at Cape Shirreff, approximately 25 km away, and Byers Peninsula, which is approximately 30 km away. Permits had been issued for the Spanish scientists undertaking work at Byers Peninsula during the 2004/05 season.

Tourism

No tourists had visited the station this season. One request had been made, but turned down due to logistic priorities on the day of the request.

Summary

Juan Carlos I continues to be an impressive summer-only station, undertaking a sound programme of scientific research. Options for the refurbishment or reconstruction of the station are being assessed this year. This is to be welcomed.

Recommendation

- Consideration should be given to bulk fuel storage facilities which incorporate secondary containment equivalent to the capacity of the tanks.

RD, JR

GABRIEL DE CASTILLA (SPAIN): Inspected 20 February, 2005

Introduction

Gabriel de Castilla is a summer-only station located on the south-western shore of Port Foster, Deception Island at Lat. 62° 53'S; Long. 50° 37'W. The station is located around 80 metres from the shoreline on a gently sloping volcanic ash substrate. The station, which is logistically supported by the Spanish Army, was established in the 1988/89 season, and last inspected in 1999 by the UK/Germany.

The station lies approximately 1 km south-east of Base Decepción (Argentina).

Physical Description

Gabriel de Castilla has expanded considerably since the 1999 Inspection. The six buildings described then, and dating from 1988 – 1991, had been augmented by a new, well-appointed accommodation block housing the lounge, kitchen and bunk rooms. Expansion of the station occurred largely between 2000 and 2001, and it now consists of eight buildings and seven shipping containers. The former accommodated the laboratory, medical building, accommodation block, emergency store, garage/workshop, boatshed/store and food store. The containers house the station's two generators, and provide separate stores for tools, oil-spill clean-up and other equipment, food, machinery and scientific materials.

All buildings and containers were in an excellent state of repair though a large fibreglass igloo building and its aluminium base had recently suffered wind damage. New fibreglass sections were on base to effect repairs and it was intended to erect a second igloo on a much stronger aluminium platform.

An interesting feature of the shipping containers, not seen elsewhere, was the addition of a sloping or gabled, corrugated metal roof bolted to the top of the container and weather-sealed to assist in shedding rain and snow and reducing corrosion. However, given that one shipping container had been moved several metres by strong winds during the previous winter, the team was surprised that all containers were not stoutly guyed down. In addition, the steel wire guys on a number of other buildings, for example the laboratory, could usefully have been of a much heavier gauge.

All buildings were set on adjustable tubular frames sitting on wooden pads on the bare volcanic ash, without the use of any deeper foundations. The pads were secured on the downhill side by steel spikes driven into the ground.

There were no tracks within the station, but easy vehicle access to the nearby Argentine Base Decepción was possible along the volcanic gravel beach.

A view of part of Gabriel de Castilla showing the new laboratory building (centre) and the storm-damaged fibreglass igloo.

Personnel

The station had been occupied since 28 November 2004 and was due to close on 7 March, 2005 when personnel would be uplifted by the Spanish naval vessel, *Hesperides*.

At the time of the Inspection there were 18 personnel on the station, including seven scientists. Two further scientists had left a week before the Inspection. Although the optimum capacity of the station was 14, during the current season the number had increased temporarily to 28 including for two and a half days a visiting party of four from the Spanish Directorate of Science and Technology.

The station support complement comprised a Station Leader (Army Major), doctor, cook, diesel mechanic, radio operator, environmental officer, and various logistic support staff all of whom were military.

Scientific Research

The focus of the station was very clearly scientific, and enthusiasm for the science programme being undertaken was evident amongst the station personnel generally. Main areas of science were geology, vulcanology, seismology and biology.

A major international science programme had been undertaken this season. This had involved 30 individuals from 10 countries (Argentina, Germany, Ireland, Israel, Italy, Mexico, Spain, Switzerland, the UK and the USA) and was an integration of geological, topographical and magnetic studies. An exchange Argentine geologist was present at the time of the Inspection. The biologists were investigating the biodiversity of the intertidal zone in Port Foster and comparing it with the situation in Tierra del Fuego.

Scientific facilities were provided in a modern, well-equipped building. This included a wet laboratory for marine biology and a conference suite. The laboratory had been created by converting and modernising the former accommodation block and had been opened formally in February 2001.

Seismic studies included the collection of data from a number of seismic arrays elsewhere on the island, including at Telefon Bay, Pendulum Cove, Fumarole Bay, Whalers Bay, and Cross Hill. These are intended to provide early warning of volcanic activity.

Logistics

Resupply was via the Spanish research vessel *Las Palmas*. This, in addition to provisioning the station at the beginning of the season, also supplied fresh food and other supplies three times during the summer season. Both *Hesperides* and *Las Palmas* also assisted with personnel movements and scientific support.

Non-potable fresh water was drawn by a pump-house from a small unnamed glacial lake adjacent to Crater Lake, around 1km to the south of the station, and stored in a 5,000 litre fibreglass tank near the laboratory. Daily water consumption was around 1,500 litres. Because of concerns about the possible heavy metal content of this water, bottled water was used for drinking. Seawater was used to flush toilets. Apparently this was more beneficial to the biological activity in the septic tank.

Power was supplied by two 85 KvA diesel generators each housed in a soundproofed enclosure within a shipping container. Fuel consumption averaged 120 litres per day, a figure achieved largely by restricting the operation of the generators to between 08.00 and 24.00 hrs daily. One generator was not functional at the time of the Inspection. This was due to be airlifted out at the end of the season by the Argentine ice-breaker *ARA Almirante Irízar* and shipped to Spain for replacement or repair (a good example of international logistic cooperation).

Alternative energy sources at the station are restricted to one small solar panel powering the automatic weather station which will transmit data to Spain during the winter. Solar panels also powered the remote seismic stations on the island.

Diesel fuel is pumped ashore through a 500 metre 75mm diameter rubber hose, to which small flotation buoys are attached at intervals. When pumping is completed the hose is purged by compressed air.

Bulk diesel fuel is delivered to the station at the end of each operational season so as to prevent condensation inside the tank and to make the station ready for the following season. Fuel is stored in one double-skinned 10,000 litre tank raised half a metre off the ground on metal saddles just up-hill of the station. The tank is top-fed and top-drawn. Its valves and inspection hatch are protected under a plastic housing. There was no sign of spillage around the tank or the fuel hose.

Fuel is transferred from the bulk tank every four days to a stainless-steel 625 litre day tank in each generator container.

Transport and Communications

Two small six-wheeled all terrain diesel vehicles (‘*Gators’*) plus a 4-wheel drive all terrain quad-bike are used to transport people and equipment around the station, during

cargo transfer, and to the nearby Base Decepción (Argentina). These vehicles are supplemented by a small rough-terrain forklift.

The station was well equipped with boats, with four inflatables (Zodiacs Mk III, IV and VI) powered by a range of outboards from 40-75 hp. These craft are used to transport personnel and equipment within Port Foster, and to service the remote seismic sites.

There is no hard helipad at the station. Given the fine, light volcanic gravel predominant in the area, extra care would need to be exercised during helicopter operations. A concrete helipad is available at the Base Decepción (Argentina), some 1 km to the north-west.

The radio room was located in the accommodation building, with e-mail, Inmarsat, and iridium telephones, as well as HF and VHF radio. Aerial systems were located behind the station.

Safety, Training and Emergency Procedures

A comprehensive training programme of field travel, first-aid and environmental protection is held in Spain, and reinforced through further training sessions and exercises on site.

A fire-fighting plan is maintained up-to-date on the station. Extinguishers and smoke/heat detectors are located throughout the base, with a central panel in the main accommodation block. The Team was however uncertain as to why the extremely - well equipped emergency building, although a separate unit, was nevertheless located within the middle of the station complex. There was a gap of only approximately 2 metres on either side off the adjacent buildings, one of which contained a micro-bakery. Re-positioning of this store may be warranted.

An Army doctor is stationed at Gabriel de Castilla. A well appointed surgery includes one patient bed, comprehensive medical supplies and a defibrillator. A stretcher-sledge is stored in the surgery. Emergency cases would call on helicopter assistance for medical evacuation to Marsh station (Chile) on King George Island.

Environmental Management

The Inspection Team was particularly impressed by the very high standard of environmental management at Gabriel de Castilla, due largely to the commitment of a station Environmental Manager. Considerable effort had clearly been put into documenting and implementing environmental procedures. It is noteworthy that Spain are in the process of implementing an Environmental Management System (EMS), with a view to attaining ISO 14001 accreditation in the future.

<u>Waste Management</u>

Wastes were segregated into paper, plastic, metal, glass and organics. These were sent to Ushuaia, Argentina for disposal. A compressed air-driven RosAuto 206 compactor was installed in the garage/workshop to reduce the volume of waste. It was unclear to the station personnel whether recycling facilities exist in Ushuaia to deal with these

segregated wastes. Waste was stored in lightweight plastic containers in front of the station. These, and similar empty containers stored between the shipping containers, though hermetically closed, were not secured, with the risk that they might be lost with the strong winds frequent at Deception Island.

Sewage is collected in a septic tank. Sludge is pumped out every 2 years and taken to Argentina for disposal. Liquid effluent is drained through a soak-away to the beach.

Environmental Impact Assessment

An EIA had been undertaken for the redevelopment of the station. Emissions from the station's generators are monitored. Furthermore, discharged sewage effluent is monitored for BOD, COD, pathogens (including coliforms), nitrates, sulphates, and phosphates.

Protection of Flora and Fauna

Deception Island is floristically one of the most important locations in the Antarctic. It also hosts important breeding populations of Chinstrap penguins.

Posters were displayed in the station with guidelines to help prevent disturbance to flora and fauna.

A ringed Brown Skua was noted scavenging in the vicinity of the station.

Pollution Prevention and Control

An oil spill contingency plan has been prepared for Gabriel de Castilla station. Absorbent booms and pads are held on the station in case of pollution incidents.

Protected Areas

A map showing the location of ASPAs 140 and 145 was displayed prominently in the laboratory building, and the Management Plans for both were held in the environmental documentation for the station.

Spain is one the proponents of the Deception Island ASMA, which will incorporate a matrix of ASPAs, Historic Sites and Monuments, a facility zone and zones within which visitor activities would be managed. A draft code of conduct has been prepared, jointly with Argentina, to guide all activities in this zone in a safe and environmentally sound fashion.

Tourism

No tourists had visited Gabriel de Castilla this season. The staff had major concerns about the scale of tourism at Deception Island, the safety of tourist activities, and the conflicts that may exist between tourism and science.

The staff also expressed concern at the lack of notification that they receive from vessels visiting Deception Island (principally Whalers Bay and Pendulum Cove), although

vessels do normally announce their intention before passing through Neptune's Bellows in each direction.

Two incidents involving visitors were reported to the Inspection Team. First, in December 2004, the entrance to a field tent located at Pendulum Cove had been opened and not properly secured, causing damage and disruption to seismological equipment. Secondly, in February 2005, a solar panel had apparently been stolen from this site, resulting in the loss of scientific and monitoring data. The Inspection Team hope that the planned designation of Deception Island as an ASMA (it is anticipated that this will be adopted at ATCM XXVIII, June 2005), and the establishment of a Deception Island Management Group, will help to resolve such conflicts in future.

Summary

A well laid out medium-sized summer-only station with a strong focus on scientific research. Gabriel de Castilla has expanded considerably since last inspected in 1999, and its facilities greatly modernised. These include the new accommodation building, the modernisation of laboratory facilities, additional storage around the station, and recently installed power plant and fuel systems. These together have provided a highly functional, modern Antarctic station geared to scientific research, and ably supported by military logistics.

Recommendations

The Inspection Team was greatly impressed by the facilities at Gabriel de Castilla and by the management of this station, and has only minor recommendations:

- Waste drums, both empty and full, should be better managed and secured to ensure that they are not dispersed into the environment;

- The security of the buildings and shipping containers against wind damage should be reviewed, and strengthened as appropriate.

MR, RD, TM, JR

Minor drafting comments of a factual nature received from Spain have been incorporated in this report.

BASE DECEPCIÓN (ARGENTINA): Inspected 20 February, 2005

The main building Base Decepción – currently unoccupied.

Introduction

Base Decepción is located at Lat. 62° 52'S; Long. 60° 43'W, at Fumarole Bay, on the western shore of Port Foster, Deception Island. It is approximately 1 km north-west of the Spanish Gabriel de Castilla Station. Established as a year-round station in 1947, it is now operated by the Argentine Navy on behalf of the Dirección Nacional del Antártico (DNA) as a summer-only station. It sits approximately 50 metres inland from the shore, at around 5 metres above sea-level, adjacent to Lake Irizar[2] , on flat ash terrain bounded on three sides by steep-sided hills.

Decepción Station was last inspected in 1993, by the UK, Italy and Korea, and prior to that in 1990 by Chile.

Physical Description

The building currently inhabited by the station personnel is in fact the emergency building. It is a corrugated iron-clad timber building with a pitched roof comprising a large garage/ workshop, a generator room, three storage rooms/ larders, a small doctor's surgery, a lounge, kitchen, Station Leader's office, radio-room, bathroom and laundry facilities. The first floor comprises 16 two-person bunkrooms.

Immediately to the north is located a timber-built laboratory with office facilities. In front of this, on the beach, there is a concrete helipad and a more substantial concrete plan, previously used for Catalina flying boats. Also on the beach, 150 m to the west, a shed was being floored with a concrete bund for fuel drum storage. Located next to it is the current emergency shed. Two disused cylindrical fuel tanks (estimated capacity 20,000 litres each) are located up hill to the east.

[2] Lake Irizar is in fact a lagoon, connected to Port Foster at its north-eastern corner.

Behind the emergency station, to the south-west, is located the substantial, but disused, original main station building. It is also a timber structure with a bitumised aluminium roof, sat on concrete foundations. It has a substantial cellar, running the length of the building. This was formerly used for storage. A number of interconnected wings gives the building a trident shape. Most furnishings have been stripped in the past, although wooden bunks and cupboards remain in the single person bunkrooms. Whilst generally sound, some water penetration was evident in this building. An attempt is underway to restore it (e.g. by providing new kitchen and toilet/shower facilities), although no tradesmen were present. The team were of the opinion that this building had the potential to be an excellent facility, although considerable resources would be needed to refurbish and re-equip it to modern standards.

Other smaller structures include disused meteorological huts, above ground pipe-work and telegraph/electrical cable support poles.

Personnel

At the time of the Inspection, there were 16 people on base, comprising 12 naval support staff and four civilian scientists. This is the maximum capacity of the current arrangement at Base Decepción.

Scientific Research

Only seismological, volcanological and geochemical investigations were being undertaken this year at Base Decepción. A simple laboratory for chemical analyses is located to the north of the currently occupied building. The Team was given a demonstration of the analysis of fumarolic gasses.

Logistics

The station is resupplied once a year by small boats or Sea King helicopters from the Argentine Naval vessel *ARA Almirante Irízar.* The station had opened on 24 January 2005, and uplift of the summer team was due to take place on 27 March.

Fuel is supplied in 205 litre drums. The maximum quantity of drums transported ashore is 60.

Power is supplied by two 24 kW generators. At the time of the Inspection, one was not working. Generators are switched off between approximately 23.30 hrs to 07.00 hrs every night to conserve fuel, and minimise the risk of fire. Total fuel consumption during the summer is approximately 12,000 litres.

The water supply for the station is provided uniquely by a freshwater bore-well. Bottled water is imported for drinking.

Transport and Communications

One 4x4 *Bombardier* quad bike is used for local transport. In addition, a Mark III inflatable Zodiac fitted with a 30 hp engine, and a Mark II Zodiac fitted with a 25 hp engine, are available for transport further afield within Port Foster.

Communications are provided by HF and VHF radio.

Safety, Training and Emergency Procedures

A naval doctor is part of the summer team at Base Decepción. A small and rudimentary doctor's surgery is located at the station, providing basic medical facilities.

No smoke detectors are installed in the living quarters, and only a few fire extinguishers were located in the main building. The Team was informed that a Fire Emergency Plan existed for the station, and that 2 fire-training exercises had been carried out this season.

Naval staff undergo a rigorous selection process prior to Antarctic deployment. Successful appointees then attend two training programmes in Buenos Aires lasting a total of two months, prior to departure for Antarctica. This includes comprehensive training in environmental management, co-ordinated by the DNA.

Environmental Management

The staff at Base Decepción seemed to be less well informed than those at other Argentine stations inspected, such as Esperanza, San Martin and Marambio, and the documentation made available to the Team was less extensive. Little emphasis was made of Argentina's considerable involvement in the preparation of a draft Management Plan for the Deception Island ASMA, which, it is envisaged, may soon be adopted by the Antarctic Treaty Consultative Parties.

Waste Management

A Waste Management Plan had been prepared for Base Decepción. Wastes were separated into three principal categories – hazardous, crushable and organic. All waste was well secured in drums and neatly stored for removal. Notices were affixed to the kitchen wall explaining waste procedures. No wastes are incinerated.

Two seasons' worth of wastes were to be removed this year. Evidence of former waste dumps remain behind the old station building, and in the gullies off the beach, to the south-west of the station.

Sewage and grey water is not treated and passes through a holding tank directly into Lake Irízar.

Environmental Impact Assessment

Environmental Impact Assessment of activities at Base Decepción is undertaken centrally by the DNA. No EIAs had been prepared this year for activities at the station.

Protection of Flora and Fauna

Deception Island is floristically one of the most important locations in the Antarctic. It also hosts important breeding populations of Chinstrap penguins.

A synopsis of Recommendation XVIII-1 was displayed on the wall of the office/laboratory at Base Decepción. An informative environmental protection leaflet, prepared by the DNA, was also available at the station.

Pollution Prevention and Control

Only drummed fuel is used at Base Decepción. The maximum possible spill size is therefore likely to be only 205 litres. Drums are opened inside the garage only, which has a concrete floor. Oil absorbent mats are kept immediately adjacent to the open drum in use. The floor of the newly converted fuel drum storage shed was being bunded when the Inspection Team visited.

Protected Areas

A map showing the boundaries of ASPAs 140 and 145 was displayed prominently on the wall of the laboratory.

Argentina have been one the main contributors to the draft Management Plan for a proposed Deception Island ASMA. This will incorporate a matrix of ASPAs, Historic Sites, a facility zone and zones within which visitor activities are managed. A draft code of conduct has been prepared jointly between Argentina and Spain. This will guide all activities in this facility zone in a safe and environmentally sound fashion.

Tourism

No tourists had visited Base Decepción so far this year. Such visits would be at the discretion of the Station Leader. Guidelines for tourist visits were displayed on the wall in the laboratory.

Summary

Base Decepción is one of the oldest stations in Antarctica which is currently operational. The Inspection Team felt that the renovation of the original accommodation building offered considerable potential. However, this might best be achieved by a more focused renovation programme involving a team of skilled tradesmen and a commitment of resources. Such renovation would enable more comprehensive scientific facilities to be installed. In turn this would allow for a wider ranging scientific programme to be instigated. As one of the Antarctic Treaty Consultative Parties closely involved in the proposal for the Deception Island ASMA, and one of the two Parties with an operational base on the island, Argentina has a leading role to play in the management of activities there.

The Team was concerned by the apparent lack of fire detection systems and the minimal fire suppressant systems on station.

Recommendations

- Adequate fire detection and suppressant systems should be provided to enhance the safety of staff at Base Decepción;

- The management of sewage and grey water at Base Decepción could be considerably improved. As a minimum, sewage effluent should be discharged into Port Foster, rather than into the brackish lagoon, Lake Irizar;

- A more focused programme of renovation needs to be undertaken if the full potential of Base Decepción, including an enhanced scientific research programme, is to be realised.

MR, RD, TM, JR

Comments received from Argentina on this report are incorporated in Appendix 1.

AKADEMIK VERNADSKY (UKRAINE): Inspected 1 March, 2005

Introduction

Akademik Vernadsky[3] is located on the Argentine Islands south of the Lemaire Channel at Lat. 65° 15'S; Long. 64° 16'W. The station is built on rocky ground about 7 metres above sea level at Marina Point, the north west corner of Galindez Island. It is operated by the Ukrainian Antarctic Centre which falls under the responsibility of the Ministry Education and Science of Ukraine.

The station was last inspected by the UK and Germany in 1999.

Physical Description

Akademik Vernadsky from the air showing from left to right the main store, generator building and main accommodation block. The black "Braithwaite" fuel tanks can be seen behind the buildings. In the foreground are the foundation piers constructed in 1998 for new fuel tanks

The layout of the station is much the same as that described in the 1999 Inspection Report (UK/Germany). 10 buildings make up the station. Most, including all but the magnetometer huts, and the VLF, former balloon-launching and emergency buildings are grouped closely around the main station buildings. These consist of the generator building, boatshed/workshop, sauna and waste management/general store.

The main station building itself dates from 1953 with additions made in 1980. It houses the living quarters (comfortable lounge/bar kitchen and bunkrooms) as well as most of the laboratories. The area to the west of this building is interconnected to the nearby buildings by means of broad wooden-decked walkways. Electrical supply to the magnetometer and VLF buildings is raised 1.8m above the ground to avoid winter snow accumulation.

[3] (Akademik Vernadsky station was formally transferred in July 1995 to the Ukraine by means of a bilateral Governmental agreement between the UK and the Ukraine. Prior to that the station had been known as Faraday. The transfer was phased, with Ukraine taking over full possession of the station in early 1996. The Memorandum of Understanding (MoU) signed between the Antarctic Research Centre (ARC) of Ukraine and the British Antarctic Survey (BAS) stipulated a number of conditions including the continuation of certain long-term science programmes, the transfer of data from the same, and timely replacement of the bulk diesel fuel tanks).

Auxillary buildings consist of a refuge hut at Rasmussen Point (Lat. 65° 15'S; Long. 64° 06'W) on the mainland, 6 km across the Grandidier Channel, and a hut on Peterman Island 10 km to the north.

The terrain around the station consists of exposed rocky knolls interspersed with moss beds. There is no helipad.

Personnel

The station complement at the time of the Inspection was 14. This consisted of nine scientists and 5 logistic support staff. The latter included a cook, two diesel mechanics and a radio operator. A seismologist also served as the Station Leader.

Hand-over to the incoming team normally takes place in late March. Personnel spend one year at the station. However, around half of the station complement had spent two years at Akademik Vernadsky (though not continuously) whilst two people were about to complete their third year. All base members were civilian.

Scientific Research

The prime focus of the station was clearly science. The ratio of scientific to logistic staff was high. Particular emphasis was given to the physical sciences although one biologist (studying inshore fish) was also present. The range of sciences included ozone monitoring, seismology, atmospheric radon studies, ionospherics and VLF investigations. In addition, two meteorologists were present. Routine tidal observations were taken.

A number of the science programmes were continuing work which had previously been undertaken by the British Antarctic Survey (BAS). This had been stipulated in the bilateral MoU relating to the station's transfer and included meteorological, tidal and geophysical measurements. Data from these programmes are passed to BAS and relevant international organisations. Akademik Vernadsky (known formerly as the UK's Faraday station) has some of the longest scientific data sets of anywhere in the Antarctic.

The conditions of the bilateral agreement will expire in 2006. Ukraine's intention was to add new elements to the science programme thereafter. For example, new magnetometers had already been installed. These were being calibrated against the existing instruments, whilst the Dobson spectrometer (which had been instrumental in the discovery of the ozone hole in 1985) was due to be replaced shortly. This instrument was housed in the loft space of the main building with direct access through the roof to the sky. During the spring period measurements were taken up to 70 times per day between 03.00 hrs and midnight.

The station's science facilities were well appointed. Most were housed within the main building. Laboratories were well equipped with computers. For some programmes, data were transmitted internationally at very frequent intervals (every 10 to 15 minutes). Ionospherics, meteo and ozone data were passed to BAS according to the MoU, microclimatic and UV data were passed to Brno University in the Czech Republic, whilst magnetics data were relayed to Canada. International collaboration also included work on GPS measurements with Germany. GPS data points had been installed in 1988 on

Galindez Island close to the main station building by the German Institute for Geological Sciences and these data points were being read every four years as part of a long term study into plate tectonics.

Logistics

Annual re-supply of the station and changeover of personnel was due to take place on 25 March using the Panamanian-flagged vessel *Ushuaia*. This vessel would be undertaking this work on dedicated charter to Ukraine having finished her tourist season in the Antarctic Peninsula. Re-supply occurred only once per year when all personnel were exchanged, stores and bulk fuel unloaded, and wastes taken on board for disposal in Ushuaia, Argentina. Since taking over the station in 1996, Ukraine has used a variety of means to effect annual re-supply. These range from Ukrainian-registered vessels to tourist ships of various flags.

Power supply was provided by three 100 KvA (80 kW) Volvo Penta generators housed in the generator building/mechanics workshop. Two new generators of the same make and power output were waiting to be installed. The older engines were to be shipped back to Ukraine for overhaul. The generators, which had integral exhaust filtration, were run in rotation for 18 days. Diesel consumption was 12 – 13 tonnes per month (around 150, 000 litres per year).

The interior of the well-appointed generator building at Akademik Vernadsky.

Fuel was stored in two "Braithwaite" tanks of 150 and 30 tonne capacity raised off the ground. The tanks are single-skinned, comprising bolted panels, and not bunded. The Inspection Team was concerned to see these tanks still in operation eight years after the transfer of the station to Ukraine. "Braithwaite" tanks were designed primarily for water storage. Although these tanks have been fitted with liners, one steel and one neoprene, the integrity of these tanks, given their construction and age must be of increasing concern. Any loss of fuel from these tanks would flow straight into the sea. Clean up of the rocky terrain in the vicinity of the tanks would be difficult.

The Team noted that both the 1993 and 1999 Inspection Reports had recommended the replacement of these tanks at the earliest opportunity. Furthermore, the Team noted that a key condition of the bilateral MoU relating to the transfer of the station to Ukraine stipulated that the bulk fuel tanks be replaced within two years – i.e. by early 1998. The

1999 Inspection reported that this work had apparently been delayed until the 1999/2000 winter season. Given that the concrete piers for new fuel tanks have been in place since at least 1998, the Team would urge Ukraine to install new tanks without delay. When that occurs the site around the tanks should be adequately bunded.

Fuel is pumped ashore through a floating hose from a re-supply vessel anchored close inshore in the Meek Channel. This process takes 10-12 hours. On completion the hose (containing around 1,000 litres) is drained by means of gravity. The refuelling hose was stored close to the Meek Channel on an elevated platform.

In addition there was a cache of Jet A1 aviation fuel in 205 litre drums adjacent to the emergency building. The purpose of this fuel was not clear to the Team. Small quantities of petrol (for the outboard engines) and lube oils were stored, in 205 litre drums, on the wooden decking adjacent to the generator building.

A nearby shallow melt-pool was being used for the fresh water supply. This is heated in winter with an electric element to prevent freezing. Bottled water was used for drinking, whilst seawater was used in the toilets. Although a Reverse Osmosis plant is installed in the main building, this was not being used. Water was discharged via a pipe at the small concrete jetty to the south of the main building.

Transport and Communications

Local transport was provided by three snowmobiles. In addition the station possessed three inflatable boats (including one RIB), three small fibreglass dinghies (3-4 metres o.a.l) and two similar sized wooden motor boats. Various sized outboard engines were present. The boats were used for local journeys around the Argentine Islands though less frequent trips as far as the field hut on Peterman Island were made. No visits had been made to the refuge at Rasmussen Point on the mainland for some years. Because of the extensive aerial arrays at the station it was not easy to land a helicopter. A well defined, elevated helipad would be a useful addition to the station and greatly reduce the risk of accidents involving visiting helicopters.

Communications consisted of HF, VHF and Inmarsat. Scientific data were transmitted electronically at routine frequent intervals. E-mail communications were however used much less frequently (only once per month) apparently due to the high cost.

Safety, Training and Emergency Procedures

One doctor is resident at Akademik Vernadsky, which is equipped with modest medical and dental facilities. Medical evacuation would rely on a ship of opportunity. For example, in May 2004, a member of the station complement had been evacuated to Ushuaia, Argentina, by the US resupply vessel *Laurence M. Gould*.

SAR is limited to the local area, and reliant on the boating capability outlined above. Boating safety plans were affixed to the wall in the accommodation building.

Fire-fighting exercises are carried out regularly at Vernadsky. Smoke detectors and extinguishers are present in all buildings, although some of the fire extinguishers were noted to be out of date.

Environmental Management

There is scope for improving environmental management at Vernadsky, and documenting environmental procedures. The Team was unable to ascertain whether any form of environmental assessment or monitoring is undertaken for activities at the station.

Waste Management

Wastes are either sealed in 205 litres drums, or, in the case of plastics, paper and cardboard, compacted and baled, and neatly stored on the walkway for removal to Argentina for safe disposal. Approximately 17 to 20 bales of 0.5 m are produced every year, as well as 10 drums of glass/metal waste. No waste is incinerated on site. The team understood that organic food waste is disposed of into the sea. Sewage is macerated before sea disposal.

Protection of Flora and Fauna

The Argentine Islands are biologically rich, with abundant vegetation covering, and at least three species of seabird nesting on the islands (Brown Skuas, Dominican Gulls and Antarctic Terns). Sheathbills, Blue-eyed Shags and Gentoo Penguins are frequently reported on Galindez Island. Recommendation XVIII-1 was prominently displayed at the station. There are no protected areas in the Argentine Islands.

Pollution Prevention and Control

The Team were disappointed to note that the “Braithwaite” tanks continue to be in use for bulk fuel storage. An oily sheen was clearly visible around the tanks. The replacement of these tanks was a condition of the 1995 MoU, and a recommendation in both the 1993 1999 Inspection Reports.

No oil-spill contingency plan or response equipment was available at the station, and no training or exercises are carried out in oil-spill response.

Tourism

Akademik Vernadsky is one of the most visited operational scientific stations in Antarctica. Usually, 2-3,000 tourists visit the station every year. This season, due to poor weather and heavy ice conditions, only 10 cruise ships had visited, with less than 1,000 tourists landed ashore. Only 5 yacht visits had been received, apparently roughly a third of what might usually be expected.

No formal written guidelines have been prepared for tourist visits to Akademik Vernadsky. Prior notice of at least 24 hours is given. Guided tours of the station are conducted in small groups of 15 –20. They receive informal presentations on the science that is undertaken at Akademik Vernadsky, although access to laboratories where

hazardous chemicals are stores is prohibited.

Under the terms of the Exchange MoU, the Ukraine are also responsible for managing Historic Site and Monument No. 62, 'Base F', (Wordie House), Argentine Islands. Due to recent problems encountered with private yacht crews, this building is now locked and the key held at Akademik Vernadsky, for distribution only as appropriate. The MoU of 1996 also required BAS and ARC to agree a Management Plan for this Historic Site.

Summary

Akademik Vernadsky is a medium-sized year-round station which has been under Ukraine ownership and operation for the past nine years. Personnel exchange and re-supply occur only once per year - there are no additional personnel during the summer season.

The ratio of scientists to logistic staff is high and enthusiasm for the scientific programmes was evident throughout the station. Data are still collected and transmitted to enhance the long-running data sets collected from this location. Over the coming years, Ukraine's intention is to expand and diversify its scientific projects as well as maintaining long-term monitoring.

The buildings and infrastructure of the station were in excellent condition. However, the Inspection Team was concerned that, despite repeated earlier recommendations, action has yet to be taken to replace the aging bulk fuel tanks.

Recommendations

The Inspection Team were of the view that:

- The "Braithwaite" tanks should be replaced as soon as possible with modern, safe fuel tanks with secondary containment (e.g. bunding or double skinned), as agreed in the MoU;

- That an oil spill contingency plan should be prepared for Akademik Vernadsky, oil- spill response equipment provided, and suitable training and exercises undertaken;

- A useful addition to the station's infrastructure would be an elevated helipad set away from the aerial arrays;

- Consideration should be given to enhancing the communication facilities (e.g. more frequent access to e-mail), to assist the management of the station and domestic arrangements;

- BAS and UAC should develop jointly a Management Plan, including visitor guidelines, for HSM No. 62, 'Base F', (Wordie House), as required by the MoU.

MR, RD, TM, JR

ROTHERA RESEARCH STATION (UNITED KINGDOM): Inspected 5 - 7 March, 2005

Introduction

Rothera Research Station is located on Rothera Point, Adelaide Island, on the west of the Antarctic Peninsula at Lat. 67º 34'S; Long. 68º 07'W.

With substantial science laboratories, boating and dive support facilities, and one of only three gravel runways on the Antarctic Peninsula, Rothera is the UK's principal Antarctic research and logistics base. It is operated by the British Antarctic Survey (BAS), under the auspices of the UK National Environmental Research Council.

Rothera was established in 1975. The station comprises 15 buildings spread over some 30,000 square metres on a rocky isthmus joining Rothera Point to Adelaide Island. The crushed rock runway was constructed in 1992.

The station was last inspected by Germany in 1999. To ensure impartiality, the station was inspected by the Peruvian and Australian Inspectors only.

A general view of Rothera Research station with one of the British Antarctic Survey's Twin-Otter aircraft in the foreground.

Physical Description

The buildings and runway of Rothera are laid out in three main groups: the fuel farm, aircraft hangar, and hardstand; the main station complex, comprising accommodation, dining, administration and mechanical services; and the wharf area, comprising the wharf, boatshed, cargo marshalling area and main laboratory complex.

The 900 x 45 metre gravel runway runs north-south across the isthmus, and has landing and runway lighting. Operational, meteorological, and flight-following services are provided for aircraft using the runway.

At the north-eastern end of the runway, an apron of approximately 80 x 100 metres separates it from the hangar and bulk fuel storage facility. The hangar has capacity for the BAS de Havilland Dash 7 aircraft and four Twin-Otters and their maintenance, as well as storage for aviation support plant, equipment and parts.

At the centre of the isthmus and to the east of the runway, two large buildings contain bedrooms and washing and toilet facilities. An adjacent two-storey building houses administration, kitchen, mess, surgery and overflow sleeping and science accommodation. The maximum capacity of the station is 136. The powerhouse, mechanical and trades workshops, and field equipment store are also located in the central area.

To the east of the runway at its southern end is a substantial wharf of 80 metres metal-piled frontage, a boat-ramp, a large arch-rib boat shed, and the laboratory building.

The Bonner Laboratory was recently constructed to replace the original, which was destroyed by fire in 2002. It contains spacious and very well-appointed microbiology, molecular, wet and dry laboratories, and a marine laboratory including aquariums. The building also houses computer rooms, a library, and a diving suite which includes a decompression chamber and hypothermia bath.

A wide hardstand area surrounds the boatshed and there is a boat ramp next to the wharf. The general condition of the station buildings was very good. Most buildings appeared sound, spacious and comfortable. The Station Leader advised the Inspectors that some buildings were now reaching the end of their design life and BAS has long-term plans for the refurbishment or replacement of the older facilities to bring them up to current UK building standards, and to deal with problems caused in winter by snowdrifts.

Personnel

At the time of the Inspection, the station population was 52, including 20 scientists. The remainder were administration, technical support, domestic support, and flight crew.

The normal wintering complement is 21. The length of posting to Rothera varies from two years, to 15 months, to a year, or some six or seven months in the case of summer staff. Changeover is by a combination of ship and aircraft. The station is visited by the BAS vessels RRS *James Clark Ross* and RRS *Ernest Shackleton*, between November and March every year. The Dash 7 flies once a week on average during the summer between Rothera and either Punta Arenas (Chile) or the Falkland Islands.

Scientific Research

Rothera supports a very wide and impressive range of high quality research. This occurs both on the station and in the field. Twenty-seven science projects were underway or had been conducted during the 2004/05 season, including atmospheric physics, terrestrial and marine macro and microbiology, meteorology, climatology, glaciology and geology. Many projects are multi-year, and several are conducted in collaboration with the research institutes of other nations, such as the USA, Netherlands and Germany.

The Bonner Laboratory provides high quality research facilities for wet or dry biological studies, as well as ample computing and desktop space.

Deep field science at Rothera is well supported by the station's aircraft, with up to four Twin-Otter aircraft in almost constant use through the summer.

The recently constructed Bonner Laboratory at Rothera.

Logistics

Rothera stores bulk fuel in six 240,000 litre steel tanks located in a geofabric reinforced gravel bund on a slight rise next to the runway apron. Three tanks contain aircraft turbine fuel (AVCAT), and three contain Marine Gas Oil (MGO) for power generation, vehicles and heating boilers. The primary bund has the capacity of one of the bulk tanks, and the secondary bund has capacity for the contents of all six tanks. During summer the integrity of the bunds is checked, and accumulated snow-melt is routinely pumped out. Each tank is emptied and cleaned once every three years.

Fuel is delivered twice each summer by ship. MGO is circulated continuously through a 150mm steel pipe which loops from the bulk storage to the powerhouse. The pipe runs above ground on supports except for a below-ground section where it crosses the runway. From the eastern side of the runway the MGO pipe runs from the powerhouse junction to the rear of the laboratory building, in parallel with the AVCAT pipe. From there, the pipes are connected to the resupply ship by 100mm rubber hose.

Six steel tanks, either self-bunded or double-skinned and between 1,400 litres and 6,000 litres capacity are located next to various buildings as holding tanks for boilers, vehicle refuelling, or auxiliary power generation. Most of these tanks are filled by a bowser tank mounted on a tracked trailer, with a capacity of 6,000 litres. Those tanks which are connected to the reticulated MGO pipeline incorporate a "dead-man's" handle on the filler as a precaution against spills. Fuel storage and handling was comprehensively audited against COMNAP's recommended checklist in January 2004.

The powerhouse contains three Cummins diesel generators of 360KW, only one of which operates at any time. Each generator is separately housed within the powerhouse, with a discrete fire alarm and suppressant system. The powerhouse also contains two day tanks of 5,400 litres each in a separate room within a concrete bund and with its own fire detection and suppressant system. Notices were prominently displayed alerting personnel to fuel handling risks and procedures, and spill containment and recovery kits were in place.

The powerhouse is heated by waste heat from the generators' water jackets. Heat is not recovered from exhaust gases, although the Inspection Team was informed of plans to improve waste heat recovery during an impending station refurbishment. Most station heating is by MGO-fuelled boilers located in each building. The boatshed, hangar, and waste handling buildings are not heated.

Transport and Communications

Rothera maintains a large fleet of vehicles and plant. A fleet of 36 skidoos principally services the needs of field parties. These are transported off-station by Twin Otter. Skidoos also provide access from Rothera to the slopes of the adjacent Wormald Ice Piedmont. Four-and six-wheel ATVs are used for light transport around the station. Numerous tractors, trailers and earth-moving plant are used to maintain the largely gravelled site. Snow blowers, loaders, and a dust-suppression tanker complete the runway maintenance fleet.

A de Havilland Dash-7 and four de Havilland Twin Otter aircraft are based at Rothera from October to March. The Dash-7 links Rothera with the Falkland Islands or Punta Arenas, and with other rock runway sites in Antarctica. The wheel or wheel-ski equipped Twin Otters fly between Rothera and its network of remote summer field stations in the Peninsula (including Fossil Bluff and Sky-Blu), the Ronne Ice Shelf, and Ellsworth Land. Depots and field camps are managed as a database from the Operations Centre at Rothera. Rothera's communication facilities include a permanent satellite data link and several phone lines through the UK to the global telecommunications system, including the internet. HF radio links the station with field parties and remote aircraft operations, and VHF is used within the general station area. A PABX telephone system links all buildings and provides a public address facility.

Safety, Training, Emergency Procedures

All Rothera staff undertake basic pre-departure training in health and safety, first aid, environmental issues, and outdoor survival. In some cases training programmes are augmented for specialists. BAS provides thorough training in fuel spill response each year, in which staff of other national programmes have also regularly participated.

On arrival at Rothera all staff receive additional training in survival and station familiarisation, as well as a package of information, advice and maps about the station, its facilities, hazards and procedures.

The station has a system of fire-tags, which requires each person to check in and out of the station central area and main buildings, and log their absences in the field.

Large-scale maps and posters are posted throughout the main buildings showing the station layout, hinterland, and access routes. Dangerous areas are zoned, proclaimed and clearly marked on maps, and onsite by flagged canes.

All regularly occupied buildings are fitted with fire and/or smoke detectors and alarms, and fire fighting gear and evacuation instructions are located strategically throughout the station. A dedicated fire vehicle is located at the aircraft hangar.

Environmental Management

The main station buildings have been progressively fitted with automatic light switches, and the importance of energy management and conservation is stressed during station induction briefings and reinforced by notices throughout the station.

The station currently makes no use of non-fossil-fuel energy sources, however the Station Leader informed the Inspectors that alternatives are being considered in planning for the long-term redevelopment of the station infrastructure over the next ten years.

Wastes are thoroughly categorised, and with the exception of food wastes and sewage, all wastes are removed from the Antarctic Treaty area in accordance with Annex III of the Environmental Protocol, and under processes spelled out in the BAS Waste Management Handbook.

Rothera's domestic liquid wastes and sewage are processed in an industrial scale aerated waste water treatment system, housed at the north-eastern end of the station. The plant produces a semi-dry sludge which is bagged and allowed to dry thoroughly before being shipped to the Falkland Islands for safe disposal. Effluent from the plant is UV-sterilised before discharge to North Cove. The effluent is regularly tested for microbial pathogens, and recent monitoring indicates that the effects of the effluent on the inshore waters of North Cove are minimal and dispersed.

Water is produced by a Reverse-Osmosis (RO) plant. Consumption over the 2004/05 summer averaged 110 litres per person per day. The brine byproduct of the RO process is disposed of into North Cove.

Metal and glass wastes are disposed of by shredding. An industrial shredder reduces cans and glass to fine shards. These are drummed and removed from the Antarctic Treaty Area to the UK for recycling. Paper, card and some plastics are compacted and also returned to UK for recycling.

Small batteries are collected according to type at a central repository in the mess quarters. Large batteries and lead-acid batteries are collected at the mechanical workshop. All are returned to the UK and recycled or safely disposed of.

Food wastes are disposed of by incineration in a small low-temperature, open-air incinerator situated near the wharf. This facility was old and in a poor state of repair. Waste residues were visible through breaches in the sides of the incinerator, and it may be possible for birds to scavenge them. The type and condition of the incinerator represent a waste solution that is somewhat at odds with the other waste treatment processes at Rothera, which are very efficient and well organised. The Station Leader advised the Inspectors that the incinerator is to be replaced as part of the planned station refurbishment.

An Antarctic Specially Protected Area, ASPA 129, is located immediately to the north-east of the station, on the northern tip of Rothera Point. The area was designated not for any intrinsic wildlife values, but rather as a reference site against which the local effects of human activities might be compared. It is well marked, with prominent signs anchored

in rock baskets at strategic approach points around the area. A path provides pedestrian access around the perimeter of the point. ASPA 129 is described in the station literature and marked on maps throughout the station.

Several species of birds frequent the station area, including gulls, skuas and petrels, but not in concentrated numbers. Numerous fur seals were observed near the station, particularly on and adjacent to the runway. A vehicle patrols the runway as required before aircraft movements to encourage the seals to move out of the way. No animal injuries or mortalities have been reported

Summary

Rothera is a modern and well-maintained station with high quality facilities supporting an impressive range of high quality research. It is well situated to serve as a logistics base for research activities on the Peninsula as well as the continent and the Ronne Ice Shelf.

Recommendations

- Early consideration should be given to replacing the existing incinerator with a contained, high-temperature one, or finding alternative disposal means for food wastes.

TM, JR

SAN MARTIN (ARGENTINA): Inspected 3 March, 2005

The main building complex of San Martin.

Introduction

San Martin was established in 1951 as a permanent (year-round) station and is operated by the Argentine Army on behalf of the Dirección Nacional del Antártico. The station is located at Lat. 68° 07'S; Long. 67° 06'W, on Barry Island, Marguerite Bay. It is the southernmost permanent station on the Antarctic Peninsula. It covers an area of approximately 0.8 km2, and is about 5 to 7 metres above sea level and 30 m from the shoreline.

San Martin was last inspected in 1993 by the UK, Italy and South Korea, and prior to that in 1989 by the UK and New Zealand.

Physical Description

The station consists of 11 buildings in total, mostly constructed in, or prior to, 1987. The main accommodation building is a two story concrete, wood and plastic panelled structure, immaculately maintained. Internally, it is lined with varnished pine. It houses the bunk rooms, kitchen and dining room upstairs, with offices, communications and meteorology room downstairs. A first floor extension, built in 2002, connects it to a large and well-maintained generator building. In addition, there is an emergency generator building, 5 storage buildings, a carpentry workshop, and an emergency accommodation building, one room of which is used as a physics laboratory. All buildings are on concrete foundations, some with concrete walls supporting plastic panels, or corrugated iron. They were, without exception, in an excellent state of repair, including the external paintwork.

In addition, there are three field huts associated with the station:

ONA	-	Uspallata glacier (5 km from San Martin)
17 de Agosto	-	Millerand Island (5 km from San Martin)
Plumerillo	-	Marguerite Bay (25 km from San Martin)

Personnel

The station complement of 17 had arrived in March 2004. They included the Station Leader and a Station Support Manager, a doctor/surgeon, two civilian scientists and one meteorologist, a carpenter, generator and a vehicle mechanic.

Annual changeover of staff was due to take place two weeks after the Inspection, by the Argentine Navy *ARA Almirante Irízar*. The Team was informed that relief and handover would normally be accomplished within two days, after which all current station personnel would return to Argentina.

Science

Science at San Martin is co-ordinated by the Instituto Antártico Argentino. It is limited to some upper-atmospheric investigations (including geo-magnetics, ionospherics and riometry), glaciology and tidal measurements. The laboratory had modest computing and physics data collection equipment. Data are provided to a number of international institutes, including the Alfred Wegner Institute and the Albert Ludwigs University, Freiburg (Germany), the Institute of Physical Geography (France) and IFA-ISAC (Italy).

Logistics

The station is resupplied once a year by the Argentine naval vessel ARA *Almirante Irízar*. Sea-King helicopters and small boats are used to transport cargo and personnel ashore.

Bulk refuelling is carried out with the use of 1,500 and 1,800 litre rubber 'rolling transit tanks' underslung beneath Sea-King helicopters. Drums of Jet A1 and petrol are also flown ashore. During refuelling, a barrier consisting of a section of aerial mast is used to contain the rolling tanks. Fuel is then pumped from the tanks into the bulk fuel farm. This comprises 9 top fill tanks of 10,000 litres and three of 15,000 litres. Two of the smaller tanks are left empty as storage space in case of fuel spillage.

The fuel farm is fully bunded. The capacity of the bund was not ascertained, but could clearly hold appreciably more than the contents of one tank full. Drain valves sited at the bottom of each tank appeared to be vulnerable to being accidentally knocked open – 'dead-man's handles', or similar, would be a significant improvement.

Fuel is transferred from the bulk tanks by flexible rubber hose to the generator day tank as required. This hose is around 150m long and traverses the rocky knoll in the middle of the station. A total of 120, 000 litres of Gas Oil Antarctica (diesel), 3,000 litres of Jet A1 and 4,000 litres of petrol are stored on base. Small quantities of fuel are also stored at the three field huts. A depot of 1,600 litres of aviation fuel is located on the Uspallata glacier.

Power is supplied to the station by three Mercedes Benz generators of 48 kW output. Fuel consumption is 220 litres per day (around 80,000 litres per year). In addition one Deutz 25 kW emergency generator with a consumption of 120 litre per day is also present.

Freshwater is supplied by two methods. Glacial ice is collected and melted in a 300 litre heated tank. This is transferred into two freshwater tanks for daily use. Additionally, a

small Reverse Osmosis (RO) plant produces 200 litres of fresh water per hour. There are also three salt water tanks - two of 1,000 litres (one of which is located in the main building) and one of 3,000 litres. This is located next to the generator building. Salt water is used principally for the toilet systems.

Transport and Communications

San Martin has an extensive fleet of vehicles, particularly given the size of its staff complement. This comprises 12 snowmobiles, 2 six-wheeled all terrain vehicles, a 'Unimog' truck, and a Muskeg fitted with a crane. A crushed-rock track runs from the helipad to the main station, and a wooden walkway leads from the main station to the carpentry workshop and storage buildings. The station has one small inflatable boat with outboard engine. This is used for local boating only.

A well maintained helipad is located to the east of the main station. Approximately 50 helicopter flights are made to and from the station every year.

Communications are provided by HF, VHF, and Inmarsat, with 24 hour internet and e-mail facilities. The station has an extensive rhombic aerial array, including 5 major masts. These effectively cover the whole station area.

Safety, Training and Emergency Procedures

Although a highly trained medical surgeon was at the station, medical facilities were relatively basic. In the case of an emergency, medical evacuation would likely be by Twin Otter from Marambio.

A comprehensive training programme, including field training and environmental protection, is undertaken in Argentina prior to Antarctic deployment.

A fire-fighting plan is held on the station, and posted at the main entrance to the building. Extinguishers and smoke/heat detectors are located throughout the base. Fire-fighting exercises are held twice a year.

Environmental Management

Environmental protection is accorded a high priority at San Martin. An Environmental Management Plan has been prepared for the station. Documented procedures and information/instructional notices are to an excellent standard, and Antarctic Treaty documentation is readily available.

<u>Conservation of Flora and Fauna</u>

Recommendation XVIII-1, and further guidelines prepared by the DNA, were prominently displayed around the station. There are no protected areas nearby.

<u>Pollution Prevention and Control</u>

Fuel storage and transfer guidelines were made available to the Inspection Team. Weekly

visual inspections of the tanks, valves and fuel pipes are undertaken. An Oil Spill Contingency Plan has been prepared, and 25 metres of absorbent booms are stored in the vehicle garage.

Waste Management

Comprehensive waste management documentation has been prepared by the DNA for San Martin, and locally prepared posters were displayed in the station lobby. The Station Support Manager oversees that waste is correctly packaged and labelled. This year, two seasons' worth of waste was due to be removed from the station. Colour-coded bins were located at convenient locations for the segregation of waste. All waste is returned to Argentina for safe disposal. Sewage is chlorinated before discharge to sea. Grey water passes via a separate discharge pipe directly to a small cove behind the station.

Organic waste is incinerated in a twin chamber diesel-operated incinerator, with a burn temperature of 5-700°C. Aqueous scrubbers are fitted for filtering gaseous emissions.

Detailed annual waste management reports are provided to the DNA.

Tourism

Generic guidelines for tourism, prepared by the DNA for all Argentine stations in Antarctica, are held at San Martin. Tourist visits are rare - no ships had visited this year, and the most recent record of a visit to the Station was by the German-flagged vessel *Bremen*, several years ago. The UK-registered yacht *Golden Fleece*, with 9 passengers and 3 crew, arrived on the same afternoon as the Inspection Team, and visited the base.

Summary

San Martin is the southernmost permanently occupied station on the Antarctic Peninsula. It is immaculately maintained, with a sense of pride, by the Argentine Army on behalf of the DNA. Environmental management is visibly accorded a high profile, and is carried out to a high standard. However, the Team was of the view that the science undertaken at San Martin was limited, and that it could be enhanced by a more focused and comprehensive programme of research.. This could be accommodated within the existing facilities, with some rationalisation – or new facilities introduced hand-in-hand with an expansion of scientific facilities.

Recommendations

- Consideration should be given to expanding the scientific capability of San Martin Station, which at present is of limited scope.

MR, RD, TM, JR

Comments received from Argentina on this report are incorporated in Appendix 1.

UNOCCUPIED STATIONS (INSPECTED)

T/N RUPERTO ELICHIRIBEHETY (URUGUAY): Inspected 11 February, 2005

Introduction

Whilst at Esperanza (Argentina) the opportunity was taken to inspect the Uruguayan station T/N Ruperto Elichiribehety, 500m to the south. The Inspection Team was accompanied by the Station Leader of Esperanza. The single building that constitutes Elichiribehety station was unlocked, though the doors were adequately secured.

A report on the state of this station was provided in the UK/Germany Inspection Report of 1999. At that time the building was being actively refurbished. The intention, as reported, was to clean up the site, modernise the facilities and convert the building into a modest but up-to-date research facility. The 1999 Inspection Report commended Uruguay's refurbishment plans, and its intention to deploy a 10 person summer research team to the station for 2-3 months by 1999/2000.

Current Situation

The single building comprising T/N Ruperto Elichiribehety. The lack of roofing membrane can be seen.

This Inspection visit presented a contrary situation. It was apparent that the building had not been occupied for quite some time. Esperanza personnel reported that only one brief visit, of around 2 hours, had been made by Uruguayan personnel over the past two summer seasons.

Although the building contained many new fittings, and some refurbishment had taken place, the condition of the building was clearly deteriorating, with, for example, paint peeling from the ceiling, and water pooling on the floor of several rooms. However, despite this and the building's 50 years-plus age, it appears to be still structurally sound. Refurbishment could be effected relatively easily and with modest effort, provided it is done without delay.

Timely consideration needs to be given to the future viability of this base to ensure that it can be put to good use and managed to an acceptable standard. The most significant issue is the lack of a weatherproof roof membrane, almost all of which has been torn off by gale force winds. Unless this is rectified urgently, the whole building will very rapidly deteriorate and become a ruin. Were this to happen, expensive cleanup and/or removal would have to be undertaken under the terms of Annex III of the Environmental Protocol.

Recommendations

- The clean-up and refurbishment programme taking place in 1999 should be resumed and sustained. If, for whatever reason, this cannot be accomplished, consideration should be given to either transferring the facility to another Treaty Party or to plan for its removal, and the remediation of the site.

TM, RD, MR

C*omments received from Uruguay on this report are incorporated in Appendix* 1

PEDRO VICENTE MALDONADO (ECUADOR): Inspected 17 February, 2005

The rear view of Maldonado Base.

The Inspection Team visited this base briefly by helicopter on 17 February 2005. Maldonado is situated just to the west of Spark Point on the northern coast of Greenwich Island and looks north-east towards the Aitcho Islands. The station is situated at Lat. 62° 08'S; Long. 58° 22'W.

The base, operated by the Ecuadorean Navy, is sited around 250 m from the shingle shoreline of the cove. Fifty to sixty metres behind the station is a knoll on which Giant Petrels were nesting, suggesting that the station had not been occupied during the 2004/05 season.

The base was closed up, with doors locked and sealed, and suspended sub-floor services removed. It consists of one main building some 35-40 by 8 metres, raised one metre off the ground by steel supports and in excellent condition. An adjacent smaller building 6 by 6 metres was assumed to be the powerhouse/garage. A section of the roof of this building had been torn off, presumably by storm damage: if not repaired the building is likely to suffer much more serious damage. Both buildings are foam insulated and metal clad and appeared to be of excellent design. A fibreglass Igloo satellite cabin ("Apple" hut) was sited next to the main building.

MR, TM, JC

CAPITÁN ARTURO PRAT (CHILE): Inspected 17 February, 2005

Capitán Arturo Prat Base was visited briefly by helicopter. The station is located on the eastern shore of Discovery Bay, Greenwich Island, South Shetland Islands at Lat. 62° 30'S; Long. 59° 41'W. It was unoccupied. The doors were locked and sealed, and windows boarded up. From external appearances of the buildings it would appear that they had not been occupied for at least 2-3 years. Paint was peeling off the walls and some wind damage was evident with a door torn off the ramp-shaped building to the north of the station.

An aerial view of Capitán Arturo Prat station.

General Comments

Arturo Prat Station lies on the flat low-lying gravel spit 150-200 metres from the shore on the north side, and only 2-3 metres above sea level. Shallow lagoons lie to the west and northwest of the base. A jetty lies to the east of the base, sheltered by the gravel spit on which the base is built.

Services for the base are elevated 1-2m above ground. An elevated 100mm steel pipe, presumably the water supply, leads from one of the lagoons to the northwest of the base.

In all the station consists of around 12 buildings, most appearing to date back to the original erection of the station in 1947. Of the eight cylindrical fuel tanks (estimated at 10,000 litres each), five were empty and four appeared to still contain some fuel, although the amount could not be determined. The paint on all tanks was heavily flaking,

and, although appearing structurally sound, the tanks were quite rusted. The tanks were not bunded, but signs of fuel leaks or spillage were minor.

The 1993 Inspection Report of the UK, Korea, and Italy noted the then Station Leader's description of plans to expand the station with additional laboratories (particularly for Marine Biology), accommodation and science programmes. It would appear that those plans have not yet come to fruition.

It is clear that without maintenance in the near future the condition of the buildings and infrastructure of this station is likely to deteriorate significantly.

MR, TM, JR

UNOCCUPIED STATIONS (Overflown)

RISOPATRON (CHILE): Overflown 17 February, 2005

Summary Description

The rear view of Risopatron. Note the storm-damage to the right hand red building.

This small summer-only station at Lat. 62° 22'S; Long. 59°40'W was overflown by helicopter on 17 February 2005. It is situated on the saddle at the base of the Coppermine Peninsula, close to ASPA No. 112 on Robert Island, South Shetland Islands, and looks over Coppermine Cove to the south. An extensive, gently sloping area of vegetation separates the station from the beach.

Sections of the north wall of one of the six buildings had been ripped off, presumably by the wind, and the debris from this littered the site.

MR, TM, JR

ALMIRANTE BROWN (ARGENTINA): Overflown 28 February, 2005

Summary Description

An aerial view of Almirante Brown. The bulk fuel tanks are located just out of the photograph to the right.

This station, first operational in 1951 is situated at Lat. 64º 54'S; Long 62º 52'W on Coughtrey Peninsula on the east side of Paradise Harbour, Danco Coast. The station looks west towards Bryde Island.

The station was apparently last inspected in 1987 by Chile and prior to that by the USA in 1975 and 1980.

At the time of the visit the station was not occupied, but had been well secured against the elements with all windows boarded up. The station consisted of nine buildings, painted red, and set on the rocky foreshore. Two buildings, well separated from the rest of the station are located on the northern point of the peninsula. Two large vertical aerials were present. A large wooden planked ramp is situated at the north of the main station with what looked like a maritime navigational mark or beacon present. Either side of the largest building present (presumably the main accommodation block), are the concrete foundation walls of previous buildings.

The station's bulk fuel supply consists of five cylindrical tanks set horizontally on an elevated platform supported by concrete pillars. Adjacent is a small pump house. A metal fuel pipe connects the tanks to the generator shed. The location of these tanks is right on the rocky foreshore and any spillage of oil would immediately enter the sea.

An extensive penguin colony occupies the ground within, and adjacent to, the station. Because of the disturbance that would have been caused by landing a helicopter anywhere in the vicinity of Almirante Brown, the decision was taken not to visit this site but simply take oblique photographs.

MR, TM, JR

PRESIDENTE GABRIEL GONZALEZ VIDELA (CHILE): Overflown 28 February, 2005

Aerial view of Presidente Gabriel Gonzalez Videla station

Summary Description

Presidente Gabriel Gonzalez Videla station is at Lat. 64º 49'S; Long. 62º 52'W on the small island (75 x 200 metres) off Waterboat Point at the northern end of Paradise Harbour, Danco Coast. The station was established in 1957 and is a summer-only facility.

Gabriel Gonzalez Videla would appear to have only been inspected once, in 1964 by the USA.

A visit to this site had been planned not only to inspect the station, but also to install a commemorative plaque at the Historic Site and Monument No. 56 (Waterboat Point). However, the whole station area consisted of a dense penguin colony and landing a helicopter in the vicinity of Gonzalez Videla would have produced unacceptable disturbance to wildlife. Instead, oblique photographs were taken of the station.

Gonzalez Videla consist of one major complex of three conjoined buildings, with a further seven outbuildings. These include what appeared to be a wastewater treatment building with pipes discharging to the shore, and a meteorological balloon-launching building.

The station includes two unbunded bulk fuel tanks, estimated at 20,000 litres each. No signs of fuel spills or leaks were discernible. Four aerial masts were present, but no aerial wires were visible.

A jetty with a drawbridge-style deck (presumably to reduce sea ice damage) is located at the north end of the island, and a small building is located on each of two adjacent islands. What appeared to be a memorial cross is located on a third small island.

There were no signs that the station had been occupied recently (at least for the past three-four years). However, the buildings and other infrastructure showed no signs of damage.

TM

YELCHO (CHILE): Overflown 28 February, 2005

Summary Description

Yelcho is a summer-only station located on the NW facing rocky shore of South Bay, Doumer Island at Lat. 64º 54'S; Long. 63º 35' W.

The team could find no indication that Yelcho had ever been inspected previously.

Yelcho from the air. Note the density of nesting penguins.

The station, which opened in 1962, consists of eight buildings or containers and is sited approximately five metres above sea level and ten metres from the shoreline. The most characteristic building at Yelcho is the main accommodation block, which is tent-shaped with metal clad walls. A similar shaped, though smaller, building is adjacent. With no windows evident it was presumed that this was a store. Outside nine 205 litre drums were evident.

Although the station was unoccupied, none of the windows had been boarded up. How long Yelcho had been unoccupied was not clear. There was no evidence of any storm damage.

The site of Yelcho station is occupied by a breeding gentoo penguin colony and it would have been impossible to land a helicopter in, or close to, the station without considerable disturbance to wildlife. Oblique photographs of the station were therefore taken from the helicopter whilst standing off from the base at some height.

MR, TM, JR

TENIENTE LUIS CARVAJAL VILLAROEL (CHILE): Overflown 3 March, 2005

An aerial view of Teniente Luis Carvajal Villaroel. Some of the 2-3,000 fur seals present can be seen.

Summary Description

Teniente Luis Carvajal Villaroel is located at Lat. 67° 45'S; Long. 68° 54'W at the south–east corner of Adelaide Island. Formerly the UK 'Base T' (Adelaide Island, and operated by the British Antarctic Survey (BAS)), it was handed over to Chile in 1984. The Inspection Team overflew the station on 3 March 2005, but did not land due to the large concentration of fur seals (estimated at 2-3,000) around the buildings. Landing a helicopter in or near the station would undoubtedly have caused unacceptable disturbance to the animals. The Team understood that Carvajal had not been occupied during the 2004/05 season. The station complex comprises 5 main buildings. From the air, the buildings seemed to be secure and orderly. 100 blue plastic 200 litre fuel drums were neatly arranged in 3 depots, around the station. Located less than a kilometre up on the glacier are the remains of an abandoned BAS de Havilland DHC 3 single-engine Otter, which over the winter had blown over, and a number of more recent fuel drums.

RD, TM, JR.

STATION UNDER CONSTRUCTION

SITE OF UN-NAMED CZECH STATION, JAMES ROSS ISLAND: Inspected 26 February, 2005

Containers offloaded on the beach for the construction of the new Czech Station on James Ross Island. Looking west towards Bibby Point.

The Team spent one hour ashore at the site of the new Czech Station, located at Lat 62° 22'S; Long. 58° 31'W, half way between Bibby Point and Cape Lachman, on the shore of Prince Gustav Channel, James Ross Island. Whilst a geological field party of three plus a Czech National Geographic reporter had been on site for 40 days, the construction team and cargo necessary to build the new station had arrived only two days previously, on 24 February, with the logistical support of the Chilean vessel, *Contro-Almirante Oscar Viel Toro.*

Eight 20' ISO containers had been brought ashore by landing craft from the *Viel*, and positioned two to three metres above the shoreline. Cargo was being unloaded, and preparations were underway to set up a temporary messing tent for the construction team. Polystyrene insulated plywood sandwich panels, from which much of the station will be constructed, were stacked on the beach – some had been damaged in transit.

When completed, the station will comprise twelve small single-storey buildings oriented east-west to maximise solar gain and minimise windage. It will accommodate up to 15 personnel over summer. The buildings will be erected on wooden footings anchored by the abundant freely available rock. The largest building – the accommodation and operations building – will have a floor area of some 10 x 26 metres.

Thirty metres uphill, a field camp of 3 pyramid tents, 3 lightweight Vertigo dome tents, and a larger messing tent had been established. The water supply was being taken from a glacial melt stream, approximately 20 metres behind the camp. An ablutions shed was located downstream to the west, alongside the melt stream and approximately 10-20 metres from the shore.

Several areas of ground had been levelled approximately 20 to 25 metres above the shoreline, in preparation for the containers. A bulldozer and a small 8x8 rubber-tracked tractor (Scot Trac 200R) were on site for construction activities. The site, on a raised beach terrace, was firm, well drained and level. It had been assessed as suitable for construction by the geological party on site. The intention was for construction activities to be undertaken until the end of March. Negotiations were underway to secure passage out from James Ross Island at the end of March, aboard the tourist vessel IB *Akademik Federov*.

Field communications were by HF, VHF and satellite. Small inflatable Zodiacs with 60 hp outboards were yet to be unloaded.

Approximately 30 drums of fuel were neatly stored beside the field camp. Czech staff reported 30 to 40 waste fuel drums some distance inland, some of which were full but rusted and in poor condition, and a BAS field depot of 25 litre cans of fuel.

Future plans are for a comprehensive scientific programme of meteorology, botany and geology, with scope for international collaboration. Full details of the station design and construction activities were provided in the draft Comprehensive Environmental Evaluation, presented as ATCM XXVII/IP03 to CEP VII in Cape Town in 2004.

RD, TM

HISTORIC SITES AND MONUMENTS

'BASE A', PORT LOCKROY: Inspected 28 February, 2005

Introduction

The British station 'Base A', Port Lockroy, is located on Goudier Island close to Wienke Island at Lat. 64º 49'S; Long. 53º 29'W. The buildings were listed as Historic Site and Monument No. 61. under Measure 4 adopted at ATCM XIX in 1995.

'Base A' was established in 1944. It operated almost continuously until its closure in 1962. The UK reviewed the status of its abandoned stations in 1994, and determined Port Lockroy to be of particular historic importance due to its significant early contribution to geology, meteorology, botany, and, during the 1957/58 International Geophysical Year, to ionospheric research.

Restoration and conservation work at the base has been undertaken by the British Antarctic Survey and the UK Antarctic Heritage Trust, and the buildings are open to visitors. The station housed three BAS staff during the 2004/05 summer, carrying out building maintenance and conservation work, providing a postal service and managing tourist visits. The station was last inspected by the UK and Germany in 1999. To ensure impartiality, the station was inspected by the Peruvian and Australian Inspectors only.

Port Lockroy Historic Site and Monument.

Physical Description

Goudier Island is the largest of several small rocky islands in Port Lockroy. It has an area of approximately 0.25 hectares and is home to a colony of some 700-800 pairs of Gentoo penguins, as well as some breeding sheathbills.

A natural rock ledge provides a safe landing site for small boats, and is connected to the main building by a pathway. From here a small network of paths allows visitors to explore the island while minimising disturbance to wildlife.

The main station building is a timber structure of some 1,000 square metres, overclad with bituminous felt which is repainted regularly. This building contains the post office and accommodation for four in a mess room. The remaining rooms have been conserved as exhibits of the early life and activities of the station.

A timber boatshed (4 x 6 metres) is located on the shore 30 metres from the main building.

Personnel

The station is staffed only during the summer, generally by 3 BAS personnel between December and March. Staff attend to the maintenance of the buildings and the site, manage visitor activity, operate the post office and shop, and monitor the impact of large numbers of visitors on the Gentoo penguin colony.

Logistics

Port Lockroy has no electrical power, and the buildings are unheated. A small solar panel array is used to recharge radio batteries. Minimal quantities of paraffin are stored for lighting, and bottled propane is provided for cooking.

Transport and Communications

Port Lockroy personnel are delivered, retrieved and resupplied by the BAS research vessels. The station's modest needs are delivered ashore by small boats. No boats or vehicles are kept on the island.

The staff at Port Lockroy are considered as a field party operating from the UK Rothera Research Station, and conduct a daily radio schedule by HF radio with it. Communication is locally by VHF, and an Iridium phone is also provided. Batteries are charged by solar panel.

Safety, Training, Emergency Procedures

Port Lockroy staff attend standard pre-departure training provided by the British Antarctic Survey, including field safety, first aid and communications. Two of the three staff are trained as paramedics, one this season is also a doctor. The base is operated according to a specific Port Lockroy procedural manual which includes coverage of field safety, health, environmental management and emergency procedures.

In the event of a medical emergency the first point of contact is Rothera, but medical assistance and evacuation may be sought from visiting vessels.

Environmental Management

Port Lockroy is one of the most visited Antarctic tourism sites, with more than 9000 visitors in the 2004/05 season. In line with stated UK policy the base preferentially welcomes the vessels of IAATO affiliated members. Limits are set for the total daily number of persons ashore, at any one time, as well as the number of people in the station buildings at a time. Under the terms of these limits, vessels carrying over 350 passengers do not land. In such cases base staff offer on-board lectures and postal services.

During periods when the site is staffed, visitors are met at the boat landing and informed of the management measures in place by the on- site Project leader.

Regular counts are undertaken to determine the breeding success of the Gentoo penguins on Goudier Island, to assess the impacts tourism. The eastern quarter of the island is roped-off as a control site.

The BAS has produced a visitor brochure containing information about the history of the site and general guidelines for avoiding the disturbance of wildlife. Posters are on display in the post office of general interpretative and site management information, including the text of ATCM Recommendation XVIII-1 (*Guidance for visitors to the Antarctic*).

Wastes are sorted and removed from the Antarctic Treaty area by resupply ship, with the exception of human waste. This is deposited in the sea from a rock ledge on the western shore, away from the boat landing.

Summary

Port Lockroy Historic Site and Monument No. 61 is an excellent model for the management of Historic Sites and tourist visits in Antarctica. Active management of the buildings and visitor activities clearly contributes substantially to the site's preservation, both in terms of its heritage and its natural environmental values. Conservation activities at the site are funded by money raised by the shop.

Furthermore, comments by the captains of two vessels (one a commercial charter yacht) inspected or visited by the Inspection Team at Port Lockroy indicate that the effectiveness of site management itself at Port Lockroy contributes to the sustained presence of the site on the itineraries of most tour operators to the Peninsula.

TM, JR.

'BASE F' (WORDIE HOUSE), WINTER ISLAND: Inspected 1 March, 2005

A very brief visit was made to the former UK 'Base F' (Wordie House), at Lat. 65° 15'S; Long. 64° 16'W, on the south-east corner of Winter Island, Argentine Islands. The base was closed in 1954 when the station was transferred to nearby Galindez Island. In 1995, it was designated as HSM No. 62 under Measure 4 adopted at ATCM XIX, in recognition of its historic importance as an example of an early British scientific base.

Wordie House (Base F) from the air.

'Base F' consists of a single 12 x 20 metre wooden building, and former HF aerials. The original station building measures approximately 5.6 metres x 5.5 metres. This houses the kitchen and bunk room and is sheathed in corrugated iron, painted black. Various extensions were added on to make an office and a store on the west side, and a pantry, store and toilet and generator shed on the east side. When operational, the station provided accommodation for up to 10 wintering personnel.

The building was restored by the British Antarctic Survey (BAS) to its early 1950's appearance. It still contains furniture and artefacts from that period. In addition, interpretative display posters on the walls outline the history of the station.

Tourist vessels wishing to land at Wordie House may do so only with the prior permission of the Station Leader at the nearby Akademik Vernadsky station, who loans them a key.

Modern day foodstuffs in the kitchen suggests that the hut may still be used as a refuge.

The station was generally in good condition, although significant moisture at three locations in the hut suggest that the roof is no longer sound and requires immediate attention. The Team understood that a small British Antarctic Survey field party would spend a week at the site in mid-March 2005 to undertake remedial works.

MR, RD, TM

'BASE Y', HORSESHOE ISLAND: Inspected 4 March, 2005

The former UK station 'Base Y'(Horseshoe Island) was visited by the Inspection Team on 4 March, 2005. It is located at Lat. 67° 49'S; Long. 66° 30'W, on an unnamed peninsula on Horseshoe Island facing Sally Cove, off Bourgeois Fjord, Marguerite Bay.

This base was occupied from 1955-1960, and again briefly in 1969. Survey, geology and meteorology were carried out from Horseshoe Island. In 1995, it was designated as HSM No. 63 (along with the associated refuge on Blaiklock Island though this hut was not inspected by the Team) under Measure 4 adopted at ATCM XIX. The site was renovated with waste removed and cleaned up by BAS in 1995. Further restoration work was undertaken in March 1997. The hut is used intermittently by BAS field parties operating out of Rothera Research Station, and has been visited very occasionally by staff from San Martin (Argentina) and cruise ships.

A general view of Horseshoe Island (Base Y)

The main building is a typical Boulton and Paul prefabricated structure of the 1950's, timber framed with vertical tongue and groove boarding on the outside walls. It measures approximately 22 metres long by 5.8 metres wide, with an extension on the south side 7.1 metres long by 4.3 metres wide housing the generator room. It has a gable roof covered with ruberoid roofing felt.

Inside, the rooms comprise a sledge workshop, a bunk room/store, radio room, bunk room/lounge, kitchen/dining room, workshop, washroom and toilet and a loft used largely for storage, with a medical room at the west end and a darkroom at the east end.

Adjacent, to the east of the main building, are located the timber bitch/pup pens. Some 300 metres further is located an emergency store. Two small wooden clinker dinghies, (one a pram), were present on the beach to the south-east of the building. A metal winch was bolted to the rocks close by. An anemometer tower and two Stevenson meteorological screen supports were sited to the north of the main building. The former

was still in excellent condition, with its galvanising intact.

'Base Y' was found to be generally in good condition. The ruberoid roofing felt was intact and securely battened down. Internally, the hut was dry and the numerous artefacts were present in an orderly fashion. Part of the roof-space had been sealed off with thick polythene sheeting and marked as 'Dangerous-Asbestos'.

Externally, the timber walls had been stripped bare of paint by wind and ice blast. Four of the windows were missing wooden shutters, and some cracks were evident in the external window panes. Two guy wires secured the generator shed and the east end of the building. A guy wire formerly attached to the middle section of the main roof span was broken and lay at the foot of the building. No guys were evident at the west end of the building.

Radio equipment at Horseshoe with Tom Maggs (Australia).

RD, MR, JR, TM

EAST BASE, STONINGTON ISLAND: Inspected 3 March, 2005

A view of East Base, Stonington

Stonington East Base (USA) was visited briefly on March 3 and inspected externally. It is located at Lat. 68° 11'S; Long. 67° 00' W, on Stonington Island, Marguerite Bay.

Stonington East Base was designated as HSM No 55 in 1987 by means of Recommendation ATCM XIV-8. The site includes two buildings and a further two smaller huts, from the US Antarctic Service Expedition (1940-41) and the Ronne Antarctic Research Expedition of 1947-48. The entrance to the southernmost of the two buildings was open with significant snowdrift into the building. Approximately one third of the roofing felt was stripped bare, and holes were apparent in the timber roof. The northern building, which included a three-storey tower, had one window open and un-boarded, also allowing snow to accumulate inside.

MR, RD

'BASE E', STONINGTON ISLAND: Inspected 3 March, 2005

'Base E' Stonington Island

'Base E', Stonington Island (UK) was visited briefly on March 3. It is located approximately 150 metres from Stonington East Base, at Lat. 68° 11'S; Long. 67° 00' W.

'Base E' was operated intermittently by the UK between 1946 to 1959 and then continuously by FIDS/BAS from 1960 to 1975. Survey, geology, meteorology, and biology were undertaken at Stonington.

The station complex comprises the main base building, a generator shed, bitch/pup pens, as well as an anemometer tower, a concrete water tank stand and a survey point. The main building, which dates from 1961, was the first two-storey building erected by FIDS. It is 35.1 metres long by 5.7 metres wide. It is steel framed with prefabricated infill panels. These are made of fibreglass insulated ply. The generator shed is located to the south of the main building, and houses a Lister generator. The bitch and pup pens are extensive – up to 150 dogs were kept at Stonington at any one time. The main pens are located to the east of the generator shed, with further pens nearby East Base.

A clean up of the base was undertaken by BAS in 1991/92. In 1995, it was designated as HSM No 64 under Measure 4 adopted at ATCM XIX.

During the brief visit, the Inspection Team were able to confirm that the buildings and dog pens were secure and in relatively good condition. Internally, little remains from when it was occupied.

RD, MR, JR, TM

VESSELS

M/V *PROFESSOR MOLCHANOV* (FLAGGED TO THE RUSSIAN FEDERATION): Inspected 27 February 2005.

Introduction

The Russian-flagged vessel *Professor Molchanov* was inspected on 27 February, 2005 in accordance with Article VII (3) of the Antarctic Treaty whilst she lay at anchor between Wiencke Island and Goudier Island, Port Lockroy. At the time of the Inspection the vessel had disembarked its passengers ashore to visit the Historic Site and Monument (No. 61) of Port Lockroy. (The Australian-flagged yacht "*Australis*" was also at anchor around 150m away – see the section on "Yachts").

The M/V Professor Molchanov *at anchor in Port Lockroy*

The *Professor Molchanov* is registered in Murmansk, Russia and owned by the Murmansk Hydrographic and Meteorological Office. At the time of the Inspection the vessel was sub-chartered to the Darien, Connecticut-based (US) Quark Expeditions from another tour operator "Oceanwide".

The *Professor Molchanov* has not previously been the subject of an Antarctic Treaty Inspection. Ideally, the Inspection Team would have preferred a longer time onboard the vessel, but due to the circumstances at the time this was not possible.

The *Professor Molchanov* was built in 1982 as a scientific research vessel. Her primary role now is however as a tourist vessel, alternating between Antarctic and Arctic summer seasons. Once the current Antarctic season was finished the vessel was due to return to the Netherlands. Here, she would be re-fitted and replenished before commencing an Arctic summer tourist season, with "Oceanwide" as the responsible operator.

At 1753 GRT, 69 m overall and a beam of 12.8 m the *Professor Molchanov* is one of the

smallest tourist vessels operating in the Antarctic Peninsula area. With a draught of only 4.5 m this vessel is able to navigate in closer inshore waters than larger ships. The vessel has an ice classification of KM UL1A2, enabling her to work heavy ice conditions. Power was provided by two main engines delivering 2,294 hp and a maximum speed of 12.5 knots. Additional maneuverability was provided by a bow thruster.

Modern communications equipment was held including HF, Telex, VHF, Inmarsat C and B and Internet.

The vessel has a maximum capacity of 80, but at the time of the Inspection it was 61. This consisted of 36 passengers, 20 officers and crew and 5 Quark Expeditions staff. The latter included the Expedition Leader, three other guides/leaders and a Manager to deal with personnel and administrative matters. The Expedition staff all had considerable Antarctic experience either previously on the *Professor Molchanov* or on one of the other Quark-chartered vessels. (Quark Expeditions operates five vessels in the Antarctic, most of relatively modest size). The Captain had 12 years' previous experience of operating in Antarctic or Arctic waters, whilst the other Officers had at least five years' experience.

The vessel's itinerary varied depending on the cruise involved. Generally, two options were offered – 'Classic Antarctica' tours lasting 9-10 days of which 4-5 were spent on the Peninsula. A longer "Explorers Cruise" of 18 days duration was also provided. These extended tours took in South Georgia, the Falkland Islands as well as the Peninsula. On most days, 3 or 4 passenger landings would be made. Each landing lasting 1-3 hours ashore. Typical destinations included: Snow Hill Island, Devil Island, Brown Bluff, Baily Head and Whalers Bay (Deception Island), Hannah Point, and Neko and Paradise Harbours. The vessel normally did not venture any further south than the Lemaire Channel and Peterman Island before returning north via Frenchman's Passage and the open sea. The Team was informed that landings concentrated on natural (geological or wildlife) visits and no manned stations were visited. The only exception was Port Lockroy. All trips operated from Ushuaia, Argentina.

Tourists were ferried ashore in Zodiac (Mk V) inflatables in groups of 9 or 10. Because of the small number of tourists carried by the vessel all passengers could be landed at the same time. A recce of each landing site would be made in advance by the Expedition Leader and the other guides and the ratio of guides to tourists ashore was never greater than 10:1, normally less. Guides were placed strategically at and around a landing site to ensure that passengers did not stray, or act inappropriately. The degree of control varied depending on the nature and environmental sensitivity of each landing site.

The Guides onboard included a biologist and geologist. The resident doctor also acted as one of the Expedition Guides. Lectures, briefings and presentations were made to passengers both before arrival in the Antarctic Treaty Area and during the trip. In addition each day would end with a round-up of the day's activities plus a full briefing of the intended itinerary for the following day including details of all of the sites to be visited. To avoid competition at landing sites the itinerary of the *Professor Molchanov* was arranged beforehand through co-ordination by IAATO. Daily communications between tourist vessels in the area further minimised the chance of two tour vessels landing at the same site at the same time.

Waste Management

All wastes were either stored onboard for subsequent disposal, or incinerated. The vessel had 70 m^3 of waste storage capacity. This was apparently more than adequate for the short journeys made. Organic waste was incinerated in a diesel-fired incinerator operating at 800°C. Incinerator ash was then stored onboard in drums. Sewage and grey water were all treated in a biological treatment plant prior to discharge at sea.

All wastes were separated onboard and returned to Ushuaia for disposal/recycling. Hazardous wastes were handled separately. These included some cleaning fluids and antifreeze from the Volvo Penta engines. Such wastes were stored in 5 litre drums (of which over 100 were carried onboard for this purpose). Batteries were disposed of separately.

Prevention of Marine Pollution

A maximum of 320 tonnes of Marine Gas Oil could be carried by the vessel. This was held in double-bottomed tanks. At the time of the Inspection 186 tonnes were onboard. In addition 400 litres of petrol (for the Zodiac inflatables) was carried on deck in 205 litre drums.

The Team was shown an in-date oil record book. In addition the vessel carried a Shipboard Oil Pollution Emergency Plan. Fuel management was the responsibility of the Executive Officer. Bunkering (in Ushuaia) normally handled 30 m^3 per hour. The Team was informed that during fuel transfer there was always close monitoring of the pumping process. Oily waste was held in a 35 tonne tank and processed at the rate of 1 m^3 per hour. No discharge of oil, or oil in water mixtures, was made in the Antarctic Treaty Area.

Ship Safety and Emergency Response Plan

The vessel was equipped with a variety of navigational equipment including three radars (two 10 cm and one 3 cm), GMDSS distress radio, digital echo sounder, GPS, Navtex and weather fax. Hand-held VHF and sextants were available as back-up. An EPIRB was positioned on the bridge and a similar further beacon sited on the flying bridge. A full range of hydrographic charts was carried along with relevant pilot handbooks.

The vessel carried a resident doctor (who doubled also as a lecturer). There was a small, but adequate surgery with examination couch, pharmacy and defibrillator. This last was always carried by the doctor during any shore landings. The sick bay contained one bed. Any serious medical cases would either require the vessel's return to Ushuaia or medical evacuation from one of the air facilities in the Peninsula region.

Conservation Policy

The Team was provided with a copy of the extensive Environmental Impact Assessment* prepared by Quark Expeditions to cover the activities of the vessels *MVs Lyubov Orlova*,

* Reference. Quark Expeditions, 2002. Initial Environmental Evaluation. Ship based tourism to the Antarctic Peninsula, South Shetland Islands and South Orkney Islands. 131 pgs.

Professor Multanovskiy and *Professor Molchanov* for the five-year period commencing July 2002. This E.I.A had been submitted to the US' Environmental Protection Agency (Quark Expeditions registered office is located in Darien, Connecticut, USA).

Copies of Antarctic Treaty documentation (including the Antarctic Treaty Handbook) were readily to hand onboard, including in the passengers' lounge. The Expedition staff were clearly well versed in Treaty regulations covering e.g. tourism, protected areas, protected species and waste disposal. Environmental awareness was high amongst Quark Expeditions personnel.

The ship operated an "open-bridge" policy and the layout of the bridge and upper deck, and their relative proximity to the water, were clearly conducive to wildlife watching.

Summary

The *Professor Molchanov* is one of the smallest tourist vessels operating in the Antarctic Treaty Area. It carries relatively few passengers (normally less than 50). It can therefore land its passengers relatively easily, rapidly and at a wide variety of sites. The vessel appeared well found and well equipped. It was apparent that Expedition staff were well versed with IAATO and Antarctic Treaty Guidelines and operating fully within their provisions.

MR, TM, JR

Minor drafting comments of a factual nature received from IAATO have been incorporated in this report.

VISITS AND MISCELLANEOUS

ECO-NELSON: Visited 16 February 2005

The Inspection Team briefly visited Eco-Nelson Base, at Lat. 62°15' S; Long. 58°59' W, Stansbury Peninsula, Nelson Island. This simple wooden structure consisting of three small huts was established by a Czech national and has been almost continuously occupied since 1988. The Team believe that this is the only building in Antarctica privately–owned by an individual. At the time of the visit, the hut was occupied by two Czech nationals, although the complement may at times rise to seven.

The somewhat makeshift, but clearly serviceable, rudimentary huts are located approximately 100 metres from the shore on a gently sloping boulder beach, at the foot of a steep cliff. The main hut comprised a hallway, kitchen, larder and living room, with an office/ radio room and bedroom located at the back. An additional accommodation building, the 'kinderhaus', is located immediately to the north-west, and can sleep up to four. A small boat store is located on the shore.

The Eco-base on Nelson Island. Note the small aerial generator.

Eco-Nelson is run on a minimal impact philosophy. Power is generated by a wind turbine. A wood burning stove is located in the lounge. Soaps, detergents and other cleaning products are not used. The quantity of waste produced is kept to a minimum, and removed from Nelson Island. The only means of transport is by sea-kayak, inflatable dinghy, or by foot or ski. Locally caught fish (*Notothenia neglecta*), seaweed, mussels and imported rice is the staple diet for the residents.

Research into remote survival skills is undertaken. Whale watches are carried out and sightings are reported to the Institute for Sea Mammal Research in San Fransisco. In addition, beach debris is collected from around the island and recorded. This information is provided to Escudero Base (Chile).

Whilst acknowledging and commending the minimal impact philosophy behind Eco – base, the Team nevertheless had some concern about the precedent that this station sets for private ownership of buildings and facilities in Antarctica.

Because of the brevity and informal nature of the visit to Eco-base, the above should not be considered as an Inspection under Article VII of the Antarctic Treaty.

MR, JR, TM, RD

YACHTS

Only few yachts were encountered during the month long period onboard HMS *Endurance*.

During the mid afternoon on 22 February *Endurance* answered a GMDSS distress call from the Canadian-registered yacht *Darwin's Passage*. The 16m yacht with four persons onboard had dragged its anchor whilst in Discovery Bay, Greenwich Island close to the Chilean station Capitán Arturo Prat. With the towing line from its inflatable dinghy wound around its propeller the vessel was incapacitated, and apparently in danger of being driven ashore. *Endurance* spent four hours transiting at full speed from King George Island to Greenwich Island. The tourist vessel MV *Explorer* also responded to the distress call and was first on the scene of the incident. Chile launched two of its SAR helicopters from Frei Station.

Endurance's crash rescue RIB, with navy divers onboard, managed to free the yacht's propeller, tow her into deeper water and re-anchor her safely with assistance from two of *Explorer's Zodiac* inflatables. The following morning the vessel reported by radio that all onboard were safe and that *Darwin's Passage* was proceeding north out of the Antarctic Treaty Area.

It was not clear to the Inspection Team whether this yacht had authorisation to be in Antarctic waters, or whether it had been at anchor within one of the two sites that comprise ASPA 144 in Discovery Bay.

Australis – *the Australian-flagged yacht at anchor in Port Lockroy.*

The 22m Australian-flagged steel yacht *Australis* was at anchor in the lee of Goudier Island, Port Lockroy (Historic Site and Monument No. 61) during the period 27-29 February. This craft had been acquired two years earlier and appeared to be a well found, robust craft with a substantial elevated enclosed wheelhouse. This vessel, registered in Melbourne, undertakes charter work, principally in the Antarctic Peninsula area. The owner and his son (skipper and deputy) were augmented by one other crew member and nine fare-paying clients. The *Australis* had been seen previously on passage off King George Island and intended being in the Peninsula area (for this trip) about one month with a party of Australian and New Zealand climbers.

The activities of this yacht had been permitted by the Australian authorities. The Team was informed by the owner that he had applied for provisional membership of IAATO (International Association of Antarctica Tour Operators).

Whilst the Inspection Team was at San Martin (Argentina) on 3 March, the UK-flagged yacht "*Golden Fleece*" anchored just off from the base. This 19.5m steel hulled schooner-rigged motor sailing ketch, with enclosed wheelhouse, was attempting to go further south with a climbing party of 8 or 9, including nationals from Ireland, Australia and New Zealand. The craft had however turned back at Lat 67º. 19'. The French skipper was assisted by two crewmembers.

The "*Golden Fleece*" is a commercial charter vessel which operates out of the Falkland Islands. This commercial yacht enterprise is a fully accredited member of IAATO and its activities had been permitted by the UK authorities.

A number of bases, including Akademik Vernadsky reported less yacht activity this year than normal, presumably due to the heavy ice conditions to the west of the Antarctic Peninsula earlier in the season.

(Note. If the application by the "*Australis*" to join IAATO is accepted, this will bring to four the number of IAATO-affiliated commercial yachts operating in the Antarctic).

PRESIDENTE EDUARDO FREI (CHILE)

During the course of the Inspection of Bellingshausen Station (Russia) on 16 February, the Inspection Team noticed that major excavations of the hillside were taking place close to Presidente Eduardo Frei station (Chile). Two large mechanical diggers were working in the area south of Frei, close to the shoreline of Ardley Cove extracting rock/spoil material from the hillside. A fleet of dumper trucks was then transporting this material through Frei station northwards.

The Team understood that this rock/spoil material (apparently amounting to 70,000 cubic metres in total) was being used at the runway at Marsh to construct an enlarged parking apron close to the aircraft hangar. This was apparently to provide additional hard standing, sufficient to accommodate one or more *Hercules C-130 aircraft.*

The excavations taking place adjacent to Frei station appeared to be of some considerable scale. It was not clear to the Inspection Team what level of Environmental Impact Assessment this extraction and construction operation had been subject to under the provisions of Annex I of the Protocol.

Responses received of a substantial nature to the Inspection Report and hereby included in accordance with Article 14 (4) of the Environmental Protocol.

Stations

1. T/N Ruperto Elichiribehety	Uruguay
2. Comandante Ferraz	Brazil
3. Vice Comodoro Marambio	Argentina
4. Petrel	Argentina
5. Esperanza	Argentina
6. San Martin	Argentina
7. Base Decepción	Argentina

INSTITUTO ANTARTICO URUGUAYO

Antártida Tierra de Paz y Ciencia

Montevideo, 27 de abril de 2005.
Nota 116/IAU/05

Señor:
Director de Relaciones Internacionales del IAU.
Dr. Héctor Vedovatti.
Presente.

URUGUAYAN COMMENTS TO ANTARCTIC TREATY INSPECTION REPORT

We are very pleased to contact you, responding with our comments to the gentle note dated 12 April 2005, regarding to the inspection of Uruguayan scientific station T/N Ruperto Elichiribehety, undertaken on 11 February 2005.

In this sense, we would like to inform that in accordance with the 1999 Inspection Report, and Uruguay´s refurbishment plans, the scientific station was actually occupied during the Austral Summer seasons 1999 and also 2000.

During this expeditions the refurbishment plan and most of the clean up programme of the site were completed and accomplished by the end of the expedition in year 2000, in accordance with the Initial Environmental Evaluation submitted to XXIII ATCM as IP 36. Actually in 2000, 6 crewmen including the station leader, and 3 scientists, among them a glaciologist from another Consultative Party, continued with the refurbishing and clean up programme, besides the undertaken of scientific activities.

The clean up activities of the site, developed in accordance with Annex III, Article 1, Paragraph 5 of the Environmental Protocol, were reported to XII SATCM, by IP 17.

In such document is stated that in the surrounding area of the station, scattered on a surface of about 126.000 m^2, in a radius of 400 m from the station building, were found a lot of waste items. These were belonging to activities performed by other Parties a very long time ago and accumulated during an extended period of time.

This waste produced by old activities of other Parties, was identified, classified and removed by the Uruguayan personnel in accordance with Annex III, Article 8, paragraph 1, as Group 3 and Group 4, during the 1999 and 2000 expeditions, involving more than 1000 hours/man of work. Other items, clearly identified pertaining to past activities of one of those other Parties, and neither

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considered by the Antarctic Treaty, nor by the Protocol, were found close to the station building.

In 2000 were removed from the site and the Antarctic Treaty area 16 m^3 waste, withdrew by means our Air Force Bell 212 helicopter and Navy ROU 26 "Vanguardia" logistic ship. That year were also identified, classified, collected and stored another 16 m^3 waste to be withdrawn the next year.

During January 2001, the last 16 m^3 waste were removed and also reparations of the structure were undertaken to solve the deterioration produced by the adverse meteorological conditions.

In January 2002 the station was visited by the ROU "Vanguardia". Due to country's economical crisis of that year, there were financial difficulties to sustain repairs, and therefore to give maintenance to the station facilities, since the public budget suffered severe fund cuts.

In November 2003 the station was visited by the ROU "Vanguardia", and one generator was taken for reparation, in order to allow power supply and adequate habitability conditions for the next year.

For the Austral Summer campaign 2004 the maintenance of the facilities had been planned in the light of the economical situation restoration. In fact the required supplies and stores, including a weatherproof membrane, were properly adquired and embarked with the respective reparation team on board the ROU "Vanguardia".

During this Antarctic campaign, in December 2004, the adverse meteorological conditions prevented the implementation of the plan. Due to strong winds, during the replenishment activities of Base "Artigas", the ROU "Vanguardia" had to leave the Collins Bay several times, getting underway according our contingency plans, in order to prevent any environmental risk.

Because of the increased fuel consumption produced by the frequent navigations, palliating the strong winds and rough sea, it would had been unsafe to approach Hope Bay in such risky conditions, for the ship and also for the possible environmental implications to be avoided, specially considering the importance of the antarctic environmental protection as a guide principle of the antarctic activities.

In this context, most of the stores foreseen for the repair of Station T/N Ruperto Elichiribehety, were left at Base "Artigas", and now Uruguay is planning to continue with this maintenance for the next summer season,

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Antártida Tierra de Paz y Ciencia

provided the recent incorporation of a larger logistic ship equipped with an helicopter.

We would like also to inform you, that we have at your disposal our photographic file where is recorded the state of the environment and the station structure, prior to the uruguayan activities of clean up and restoration, and also once the refurbishing of the station and clean up of the site were completed.

With our best regards.

Yours sincerely,

The President of the Uruguayan Antarctic Institute.

Rear Admiral

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PROGRAMA ANTÁRTICO BRASILEIRO - PROANTAR

Dear Dr. Richardson

I would like to inform that PROANTAR received the report you sent via email on April 12th, 2005 to Ms. Brito. We are glad to know that you were welcomed warmly at our Comandante Ferraz Station (EACF) that all the information you needed were received while the inspection. We appreciated your recommendations, all of them were considered valuable to improve our facilities. They were also recognized as international collaboration and information exchange factors, because they are benefic to the activities performed by all the Antartic Treaty signatory Parties in the area.

However, we would like to make some comments and also suggest some amendments to the report main topics.

1) Scientific Research

We have about 8 Brazilian Universities and 2 research institutes involved in scientific investigation at Ferraz. Every year our National Council on Scientific and Technological Development (CNPq) selects the institutions who will develop research at Ferraz.

While OPERANTAR XXIII (2004/2005) 21 projects have been developed. They are allocated as follows:

Global Environment Changes Research (NETWORK 1):

- 4 field projects (Elephant Is. and Guerlache Strait); and
- 6 projects supported by EACF.

Environmental Monitoring Program Research (NETWORK 2):

- 8 projects (at EACF);
- 1 biology project (at King George Is);
- 1cartography project; and
- 1 architecture project.

A considerable amount of PROANTAR research projects are already developed with international cooperation counting on scientists from several Antarctic National Programs. It is a trend that will be stimulated by offering, in the up-coming meetings, starting at XVI RAPAL, places in on-going research during every season.

2) Physical Description

The Director Plan, recently approved, for EACF foresees:
a) A garage expansion, in order to shelter all station's vehicles while winter; and

b) A stores' area increase, in order to provide a better storage condition to spare parts, food in general and to material used on scientific researches.

The above mentioned measures, a) and b), and the Director Plan, as a whole, were designed to last the next three years. It is important to mention that there is no intention to increase the building area beyond its present limits. It means that, we will only add new edifications in order to change the multi-sided perimeter into a perfect rectangle.

PROANTAR performs every summer a comprehensive maintenance program at Ferraz along with Arsenal de Marinha do Rio de Janeiro (Brazilian Navy Shipyard at Rio de Janeiro). This maintenance covers electrical, engine, generator, container and wooden structure areas. The earlier mentioned Director Plan is a comprehensive and wide-ranging plan, which concerns about the rust and all kind of matters which affects Ferraz structure. PROANTAR and ARQUIANTAR (architeture experts from Universidade Federal do Espírito Santo) have a project which is in charge of developing appropriate technologies and action plans to minimize the environmental impact due to Brazilian Antarctic edifications. This will be achieved by optimizing maintenance procedures, growing zonation and specific usage proceedings

3) Logistics and Infrastructure

The following amendments are suggested on the information given on your report about personnel transportation by aircraft:

- Four support flights are accomplished using ***Hercules C-130*** from Brazilian Air Force (FAB), between Rio de Janeiro, Brazil and the Presidente Eduardo Frei Chilean Air Base, in King George Island along summer season. At the same day, researchers, technicians from Arsenal de Marinha are transported to vessel Ary Rongel and then to Ferraz Station. Once a year, on February flight, the relaying Support Group (Brazilian Navy staff) is transported to Ferraz to accomplish his one-year season.

- Along winter, three support flights are accomplished using ***Hercules C-130*** from Brazilian Air Force (FAB), between Rio de Janeiro and the Presidente Eduardo Frei Chilean Air Base. However, the resupply during wintering is done by parachuting the resupply boxes into Ferraz Area.

Because Brazilian Navy Station team is strongly concerned about the environmental risks that can happen during the bulk re-fuelling, we became very proud when you mentioned the care and good monitoring procedures employed by our station and vessel teams.
Due consideration was given to the building of the valves cover and pipe system. This measure is included in the director plan and is expected to occur on the first half of next summer season.

4) Transport and Communications

PROANTAR has finished a communications update plan which will upgrade all the equipment presently installed at Ferraz. This update process will increase station's internet and telephony capacity (broader band satelite link) helping our researchers to exchange informations with their universities or institutes and foreigner similar organizations.

As mentioned before, we intend to increase the garage size to provide a better shelter to our vehicles, specially during wintering

5) Safety, Training and Emergency Procedures

The Brazilian Navy personnel assigned to Ferraz Station – a group of three officers and seven enlisted, who will spend 12 months in the station – went through a thorough psychological and medical screening process along the selection. Before departing to Antarctica everybody receive at least two weeks of training on cold weather survival and on requirements and obligations of the Antarctic Treaty and the Protocol. Military receives an extra week of training on first aid and emergency response. All military personnel is also trained on a fire-fighting refresher course.

6) Environmental Management

Station personnel is familiar with the Antarctic Treaty and the Protocol and their provisions. Usually, there are copies of these issues available at the station. All personnel were required to take a two or three weeks (depending on how long will last the stay),training and instruction course, in which is included a detailed orientation on the Treaty and the Environmental Protocol. We also emphasize to scientific personnel to be aware with the provisions of the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). We also became very proud with your words about the environs maintenance.

Waste Management

The replacement of some waste management equipment, as the incinerator and the compactors, is In foreseen in the Director Plan.
A comprehensive study, conducted by Brazilian Navy Civilian Constructions Directory, of a new Sewage Treating System is on the way, a eletrofloculation facility is being analyzed.

Environmental Impact Assessment

Prior to Antarctica departure, every project submit its plans to our Environmental Officer in order to provide the proper preliminary assessment of which kind of impact the undertaken activities might cause.

Protection of Flora and Fauna

Along with the posters notifying staff of the recommended procedures to avoid nature disturbance. Posters regarding the prohibition on the discard of plastic and other kinds of waste is usually affixed.
Regarding the Geographic Information System (GIS), it is important to say that it is not being developed independently of the management provisions of the ASMA for Admiralty Bay. It is a scientific activity whose objective is provide environmental data integration to our ASMA management plan. Concerning the earlier mentioned management plan, our Environmental Officer, Ms. Brito, already prepared a draft of this paper and submitted to the Parties with facilities on the Admiralty Bay area (Ecuador, Peru, Poland and United States) asking for suggestions and any other relevant information. This final version paper will be submited to XXVIII ATCM as working paper.

7) Tourism

While 2004/2005 summer season, twice a month, at least, one cruise ship or ocean sail boat visited Ferraz area. We ask to every ship to organize groups of 30 visitors before ashore. This measure is necessary to provide the groups the best assistance and be able to neatly arrange the visit to Ferraz. During a tourism ship visit, a station staff member lead the 200 German tourists through a comprehensive tour around the laboratories area, accommodations´ block and other not dangerous areas. PROANTAR is propitious for touristic activities with environmental awareness.

8) Summary

We appreciate your comments about our station structure compound of 20ft shipping containers. Of course weather conditions and age are showing its effects on the whole structure; however, the Director Plan contains measures to strike these structural problems.

As mentioned before, Director Plan foresees a larger optimization procedures and we thank you for your relevant suggestions of enlarging the library and the computer suite.

Regarding to our helipad, we intend to rearrange the area below the pad and convert it into stores

9) Recommendations

- International scientific collaboration: please read item 1, last paragraph;
- GIS: Mapping and management plan for Admiralty Bay ASMA, considerations on item 6;
- Fuel tank farm cover – its building is included on Director Plan, see item 3;
- It is also included on the above mentioned Director Plan the replacement of extinguishers/hoses system and general system update will be carry out;
- Whaler seaboat and former Base G plaque: PROANTAR will contact BAS to receive more information and relevant data about both sites and make

arrangements about production and purchase of suggested plaque. We also intend to request to ARQUIANTAR team to study how to maintain and protect the historic sites.

JOSÉ EDUARDO MARTINS P. VILLANOVA
Captain
Undersecretary for PROANTAR

Inspection Report (UK, Australia and Perú)
Comments by Argentina

Marambio Station

Marambio station not only provides support to other Argentine bases but also to scientific camps. During spring and summer one of the main purposes of the station is to provide support for a large number of scientific field camps, undertaking studies and activities in geology, paleontology, glaciology and historic sites conservation, some of them in cooperation with other Consultative Parties.

Marambio station is one of the three Antarctic stations that launches stratospheric balloons, as part of the ozone sounding activities carried out at the station. These data are therefore worthly to predict changes and the evolution of the ozone hole in Antarctica. Data on Ozone sounding are forwarded to the *World Meteorological Organization* (WMO) and are available to the public through the Internet.

The Dirección Nacional del Antártico (DNA) prepared an *Environmental Review of the Argentine Activities at Marambio*, a thorough assessment of human impacts on the existing environmental values in the area of Marambio Station. This document was presented in the CEP I, Christchurch, 1998, as IP #49, and updates to it were presented at CEP II (Lima, 1999), as IP #90, and at CEP VI (Madrid, 2003) as IP#43.

Concerning treatment of historical wastes around the station, an evacuation plan was initiated in 1995, which included unearthing of very large volumes of wastes (basically wooden, steel and tin residues) around the Main and Emergency Accomodation blocks, followed by its classification and evacuation. In addition, a special task group is currently working every summer season in order to remove accumulations of discarded fuel drums from different areas of the island. All these activities were included in the above mentioned Information papers presented to the CEP.

Although Marambio Station's fuel tanks are single-skinned and they are not bunded, that does not necessarily mean that fuel storage at Marambio station presents a significant risk to the environment. It should be noticed that in Marambio station important modifications to the aircraft refueling platform have been introduced in recent years. The fuel storage main plant (Arctic Gas Oil), comprising a 30 tank-battery (20.000 liters each) has undergone significant structural modifications. After an external audit conducted by the private oil company YPF, the system connecting all tanks was completely removed. Such a system represented a potential high-risk for major spills and therefore their ducts and valves have been replaced by blind bridled lids and 3-inch plugs respectively. In parallel, a pipe system connecting 12 tanks through valves now runs above the tanks. In addition, the fuel tanks battery (JP1 aviation fuel) has been relocated to a more distant position from the airstrip and its fuel storage and ducting systems have been replaced with new ones, according to international safety regulations. Improvements include: installation of main and auxiliar ducting systems with non-trigger locking nozzles and with lids to avoids spills, posting identification signals (*type of*

product, danger explosive and *no smoking*) as well as new annual maintenance services provided by private sector.

With regard to the supply of potable water for Marambio station, actions have already been taken to remediate this situation in the near future. The Environmental Department of the DNA prepared an Initial Environmental Impact Assessment (IEE) for the construction of a new source of potable water, whose main purpose was to analyze likely environmental impacts stemmed from the building of a larger, man-made, pond, able to supply the station with potable water during the whole year.

Petrel Station

Petrel Station is a non permanent station. For this reason, maintenance and cleanup activities are currently being carried out, as a first step of a more comprehensive planning process, which include reassessing of all station facilities. This reassessment, once completed, will allow a sound planning of further measures. In this context, baseline geologic studies are being undertaken at Petrel station.

Esperanza Station

Concerning the apparent lack of visitor guidelines at Puerto Moro, it should be noted that a big wooden sign, written in Spanish, lies to the left of the path leading to the base, which summarizes the visitor guidelines that should be observed at the stations.

San Martin Station

The laboratory has a computing and physics data collection equipment. There are several Cooperation Agreements with some Consultative Parties. Until now the standard of the data has been very satisfactory.

Decepción Station

Staff from all Argentine stations, including Decepción Station are given the same kind of training on environmental issues, which, since some years ago, did include the designation of an ASMA at Deception Island and the implications of such a designation within the Antarctic Treaty System. The same applies to the educational and other documents connected to the Antarctic Treaty and the Madrid Protocol.

Argentina is already aware of the need to improve the sewage and grey water system at Base Decepción, and, at present, new likely alternatives to it are being assessed. As solutions require inputs from different areas, and will have logistic, financial and environmental consequences, this issue is still awaiting further definitions before taking a definite decision.

General Considerations

1. All the Argentine Stations are under the responsibility of the Dirección Nacional del Antártico (DNA) which is answerable to the Ministry of Foreign Affairs, International Trade and Worship. Advice on environmental management is provided by DNA. Science is under the surveillance and responsibility of Instituto Antártico Argentino (IAA) while logistics is carried out by the Armed Forces, which report to the Ministry of Defence.

2. All stations report to the DNA, on a monthly basis, on waste activities (production, treatment, accumulation and evacuation). The same applies, although annually, to tourist activities. Information on eventual environmental incidents (such as oil spills) is provided by each station to the DNA immediately after their occurrence, following COMNAP's formats and recommendations.

3. All activities undertaken by the Argentine National Antarctic Program, including routinary maintenance activities carried out by all stations, are annually assessed from the environmental point of view by the DNA, in order to comply with Annex I requirements (an *ad hoc* form, available through Internet, is used as a basis for this task). As the environmental impact of these maintenance activities, carried out routinarily, are well known to cause less than minor/transitory impact, no IEEs or CEEs have ever been prepared for this sort of activities.

4. The Environmental Program of the DNA has prepared several documents, which describe procedures that all Argentine bases have to comply with, related to Waste and Management and Contingency Planning. These documents are also supported by other educational material. They are all available at Argentine stations.