ANTARCTIC TREATY
XVIII th CONSULTATIVE MEETING

TRAITÉ SUR L'ANTARCTIQUE
XVIII éme RÉUNION CONSULTATIVE

TRATADO ANTARTICO
XVIII REUNION CONSULTIVA

ДОГОВОР ОБ АНТАРКТИКЕ
XVIII КОНСУЛЬТАТИВНОЕ СОВЕЩАНИЕ

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REPORT OF A JOINT INSPECTION UNDER ARTICLE VII OF THE ANTARCTIC TREATY BY UNITED KINGDOM, ITALIAN AND KOREAN OBSERVERS, JANUARY - FEBRUARY 1993

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Item 8(a)
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Foreign and Commonwealth Office, London
Ministry of Foreign Affairs, Rome
Ministry of Foreign Affairs, Seoul

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Introduction

At the invitation of the United Kingdom Government, the Governments of Italy and Korea agreed to undertake a joint Inspection of Antarctic facilities early in 1993, in accordance with Article VII of the Antarctic Treaty.

In planning for, and carrying out, the Inspections particular attention was paid to the provisions of the Environmental Protocol to the Antarctic Treaty, adopted by Treaty Parties in October 1991. Although the Protocol has yet to be ratified and enter into force, Treaty Parties, at the XVI Antarctic Treaty Consultative Meeting in Bonn, 1991, pledged to implement its provisions, in the interim, to the maximum extent possible.

In accordance with Article VII (1) of the Treaty, each country designated observers and communicated their names to the other Consultative Parties.

The observers for the United Kingdom were: Mr Munro Sievwright, (British Antarctic Survey, Cambridge – Team Co-ordinator), Captain R M Turner (Royal Navy, Commanding Officer of *HMS "Endurance"* in which the team travelled, and Lieutenant Commander John Larby (also of *HMS "Endurance"*).

The observer for Italy was: Dr Pietro Giuliani (Antarctic Project, ENEA – Agency for New Technologies, Energy and Environment, Rome).

The observer for the Republic of Korea was: Dr Soon-Keun Chang (Director, Polar Research Centre, Korea Ocean Research and Development Institute, Seoul).

The joint team inspected 16 stations (including three abandoned ones) of eight nationalities in the South Shetland Islands and Antarctic Peninsula, between 12 January and 14 February. In addition, for the first time in an Antarctic Treaty Inspection, three tourist vessels were inspected in the area. This enabled the team to widen considerably its coverage of tourist activities.

The Inspection team was on board *"HMS Endurance"* from its departure from the Falkland Islands on 10 January 1993, until its arrival in Punta Arenas on 18 February 1993. The intervening itinerary was as follows:-

Date (1993)	Station/Ship	Country
January 12	King Sejong	Republic of Korea
January 13	Juan Carlos Primero (Occupied in Summer only)	Spain
January 15	*MS "Explorer"* (Tourist Vessel)	Liberia
January 16	Faraday	United Kingdom
January 18	Rothera	United Kingdom
January 23	General San Martin	Argentina
January 29	Base E, Stonington Island (Abandoned)	United Kingdom

Date (1993)	Station/Ship	Country
January 29	East Base, Stonington Island (Abandoned)	United States
January 20	Fossil Bluff (Occupied in Summer only)	United Kingdom
February 2	Palmer Station	United States
February 4	*MS "Akademik Sergey Vavilov"* (Tourist Vessel)	Russia
February 6	*MS "Europa"* (Tourist Vessel)	Germany
February 7	Gabriel de Castilla (Occupied in Summer only)	Spain
February 8	Decepcion (Occupied in Summer only)	Argentina
February 9	Comandante Ferraz	Brazil
February 9	Henryk Arctowski	Poland
February 11	Arturo Prat	Chile
February 13	Deception (Abandoned)	United Kingdom
February 14	Esperanza	Argentina

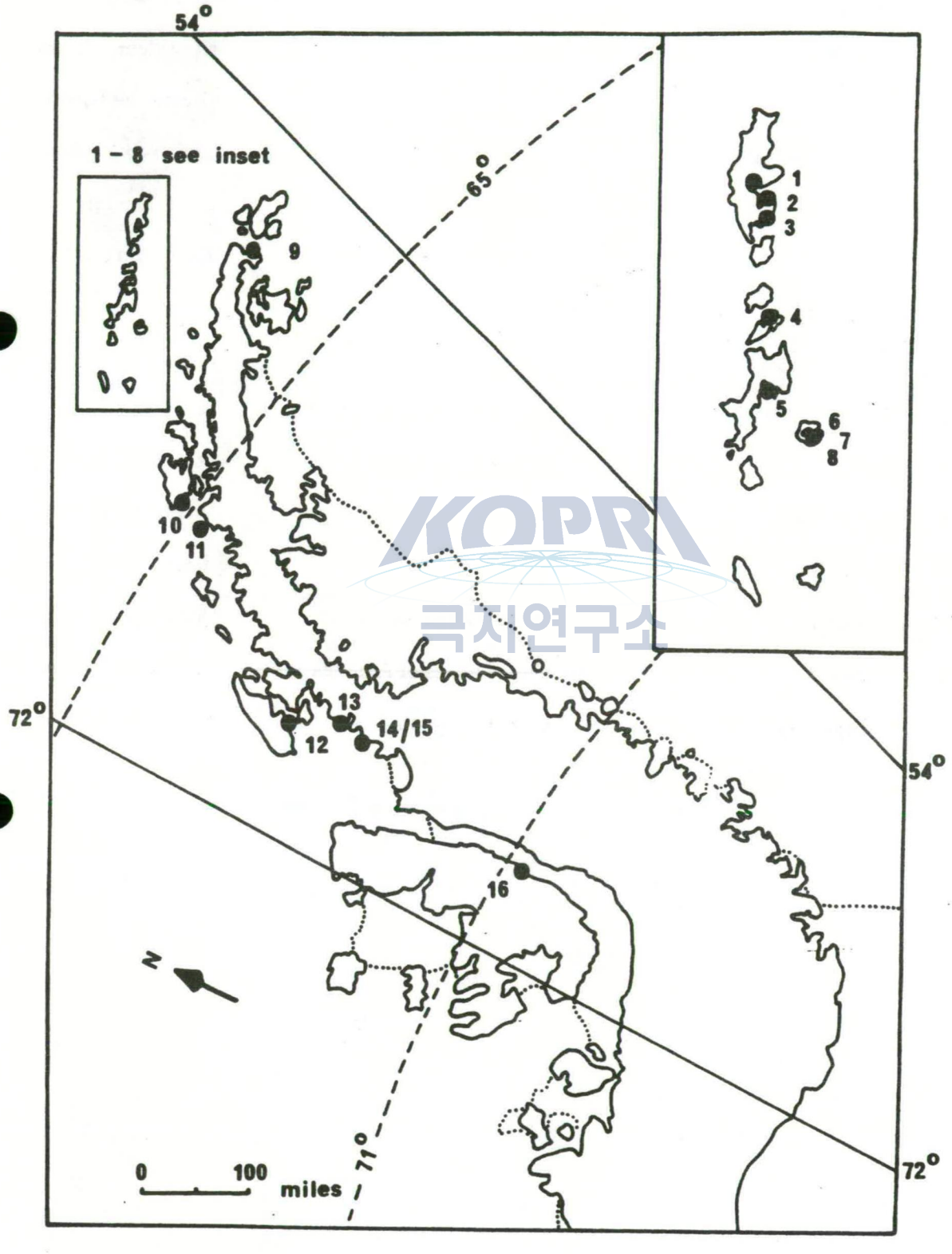
The location of the stations is shown in Fig 1.

The visit to each ship or station took between four to six hours. The Inspections were conducted on the basis of Checklists designed for, respectively: occupied stations, abandoned stations and tourist vessels. These Checklists are appended as Annexes A–C. Tourist vessel Inspections were made with the prior consent of the ship's Master and while the vessel was at anchor. The focus of the Inspections was on environmental issues including procedures for the disposal of waste and protection of Antarctic flora and fauna.

All members of the Inspection team wish to express their warm appreciation for the welcome they received at each station or ship and the hospitality they were shown. Their task was eased by the strong spirit of Antarctic co-operation evident everywhere they went.

The report on each station sets out in summary form the central considerations as the team saw them. The information has been presented in this way in an attempt to provide a coherent and consistent picture of each of the stations visited.

Figure 1: LOCATION OF THE BASES IN THE PENINSULA AREA INSPECTED DURING THE 1993 INSPECTION PROGRAMME – WITH AN INSET OF THE SOUTH SHETLAND ISLANDS



	Station	Country	Location
1	Comandante Ferraz	Brazil	King George Island
2	Henryk Arctowski	Poland	King George Island
3	The King Sejong	Republic of Korea	King George Island
4	Arturo Prat	Chile	Greenwich Island
5	Juan Carlos Primero	Spain	Livingstone Island
6	Gabriel de Castilla	Spain	Deception Island
7	Decepcion	Argentina	Deception Island
8	Deception	United Kingdom	Deception Island
9	Esperanza	Argentina	Trinity Peninsula
10	Palmer Staion	United States of America	Anvers Islands
11	Faraday	United Kingdom	Argentine Islands
12	Rothera	United Kingdom	Adelaide Island
13	Gen San Martin	Argentina	Barry Island
14	Base E	United Kingdom	Stonington Island
15	East Base	United States of America	Stonington Island
16	Fossil Bluff	United Kingdom	Alexander Island

THE KING SEJONG (KOREA): visited 12 January 1993

Physical Description

The King Sejong Station is situated a short distance from the shore on the southern side of Marian Cove, Maxwell Bay, King George Island, South Shetland Islands at position 60° 13′S, 58° 47′W. The station exists for scientific research. It is operated by The Korea Ocean Research and Development Institute.

The station lies at the north-east corner of Maxwell Bay around which there are four other stations towards the west. The nearest station, however, is Jubany (Argentina) which lies about 6 kilometres to the south-east.

The King Sejong station was constructed during the 1987/88 season and opened on 17 February 1988. Two storage buildings located about 500 metres along the shore and an extension to the generator shed were added in 1991. The main buildings are constructed of insulated metal panels and consist of four accommodation blocks approximately eight metres by 20 metres raised a few feet above the ground and a two-storey building housing the generators and other plant. These buildings

are connected only by ducts within which run services. The generator building connects directly to the single-storey extension built in 1991. The recent date of construction means that the exterior condition of the buildings is good although repainting of the underside of the accommodation was in progress. The area of the station, about 0.5 square kilometres, was neat and tidy. There are no plans for expansion of the station.

Personnel/Military Support

The station is manned throughout the year, in winter by 12 to 14 personnel and in summer by about 25. Personnel are all civilian and there is no military support. At the time of the Inspection the station complement consisted of eight scientists and 14 support staff. Two of the latter, engaged on external maintenance, were Chilean. Wintering personnel spend about 12 months at the station, others about two months. All personnel are screened prior to Antarctic service for medical and dental health and for winters in respect of their mental state.

Scientific Research

Research includes programmes on oceanography (also making use of the Korean research/re-supply ship), biology and micro-biology both terrestrial and marine, geology, geophysics, seismology, surface meteorology and upper atmospheric physics. Equipment for the last is housed in a separate small building. All other laboratories are located in the main accommodation with considerable ingenuity used in local construction of experimental equipment to supplement the considerable range of commercially produced items. Most of the scientists at the station have post-graduate qualifications and experience. Although no foreign scientists were present, there is collaboration with the USA on upper atmospheric work while discussions proceed with Argentina and Chile about ichthyology. Carbon 14 is used for primary production studies.

Logistics/Equipment

The main resupply of the station is made annually by ship complemented by two deliveries of fruit and vegetables by air through Eduardo Frei Station (Chile) with final delivery by helicopter.

Diesel is stored in six 150–tonne capacity cylindrical single-walled steel tanks. Each, mounted on two concrete saddles, is surrounded by insulation and an outer metallic covering. There is no protective bunding around the tanks though the Station Commander hopes to take measures to improve protective containment this winter. The tanks are in two well separated groups of three, one of which is above and not far from the two lakes used for water supply. Fuel is pumped from the tanks to the generator building through stainless steel pipework mounted on supports above ground, insulated, heated and with manual isolation valves. A daily manual check of tanks and pipes is made and recorded. Resupply is accomplished using flexible hose from the supply vessel to connect to the fixed pipes on shore, the hose being blown through after the completion of the exercise. Forty 200–litre drums of petrol are held but it is planned to replace these with plastic bladders. Twenty drums of kerosene are also held together with two tonnes of LPG used for cooking. All fuel held is for use on the station.

An oil spill contingency plan has recently been sent to SCALOP and, although at present no equipment is held to deal with a spill, provision is planned. In November 1991, about 15 tonnes of diesel escaped when a pipe cracked due to settlement of a support when the pipeline was covered by drifted snow. No significant sign of this spill was observed during the Inspection.

Small quantities of hazardous chemicals and some formalin are stored in their original shipping containers in laboratories. In view of the small quantities, there is no specific marking or inventory of the chemicals. Electrical power is provided by diesel generators, three of 113 kw capacity and two of 275 kw; normally only one generator is used at any one time; exhaust emissions are neither filtered nor monitored. Heating is by hot air produced by small burner units in each building.

Transport and Communications

There is about 600 metres of crushed rock roadway within the station. Land transport consists of one Kaessboher tractor, one amphibious vehicle, a Unimog fitted with a crane and a forklift; during winter use is made of one Yamaha and two Alpine snowmobiles. Three Zodiac inflatables are used, a small jetty constructed of precast concrete blocks is available for use by small craft. A flat area of pebbles between the shore and the station buildings is marked as a helipad which could be used by machines as large as a Chinook or Mil8. No facilities exist for fixed wing aircraft.

Inmarsat is currently not operational, awaiting repair. There are no new communications facilities not covered by the 1992 SCALOP Exchange of Information.

Arms and Explosives

No firearms or explosives are held on the station.

Environmental Protection

(i) Services and waste management

Potable water is obtained during the summer from two small ponds, one natural the other man-made, located a short distance from the main buildings. During winter, a reverse osmosis plant capable of producing 3,000 litres per day is used.

Waste is separated after collection. Staff are briefed verbally on the procedures to be followed with the various categories. A compactor is used and, with the exception of combustible material, all waste is retrograded to Punta Arenas where it is passed into the hands of the ship's agents. There is a single stage incinerator but, at the time of the Inspection, this was out of action awaiting delivery of spares within the next few days. There is no control or monitoring of emissions. Installation of a double stage incinerator is proposed. It was noted that some waste stored outside the accommodation prior to processing was not well secured against wind.

Sewage is biologically and chemically treated before discharge to the sea.

(ii) Emergency response capability

No specific medical emergency response plan exists. The station is close to a number of other stations which could assist. There is a doctor on the station but no surgery. A fire detection system is present with appropriate extinguishers including halon in some areas. Notices about fire precautions and procedures are displayed and a fire fighting exercise is held once a month.

Staff are trained to basic fire-fighting level. Separate emergency accommodation is available.

(iii) Environmental Impact Assessment (EIA)

An EIA was prepared for the additional construction work carried out in 1991; a copy was made available. No immediate need was foreseen for a further EIA, but the impact of future activities would be assessed. Monitoring of the station's environmental impact is undertaken through a programme on chemical and biological changes. The following environmental indicators are monitored to assess environmental impact:-

(a) benthic algae,

(b) the penguin rookery about two kilometres away, and

(c) phytoplankton.

(iv) Conservation of flora and fauna/protected areas

Staff are briefed during training in Korea on the need to minimise environmental impact and on the conservation of flora and fauna. This briefing is continued on site. Staff sign a pledge to protect the environment.

Permits were issued for the killing of a fur seal and a small number of penguins for museum specimens. There are a few tomato and ornamental plants on the station but no pets. There are no protected areas in the vicinity of the station but site descriptions of those on King George Island are held. Permits were issued for entry to a Site of Special Scientific Interest (SSSI) in order to carry out scientific research. Staff are told not to walk on lichen rich areas.

Tourism/NGO activity

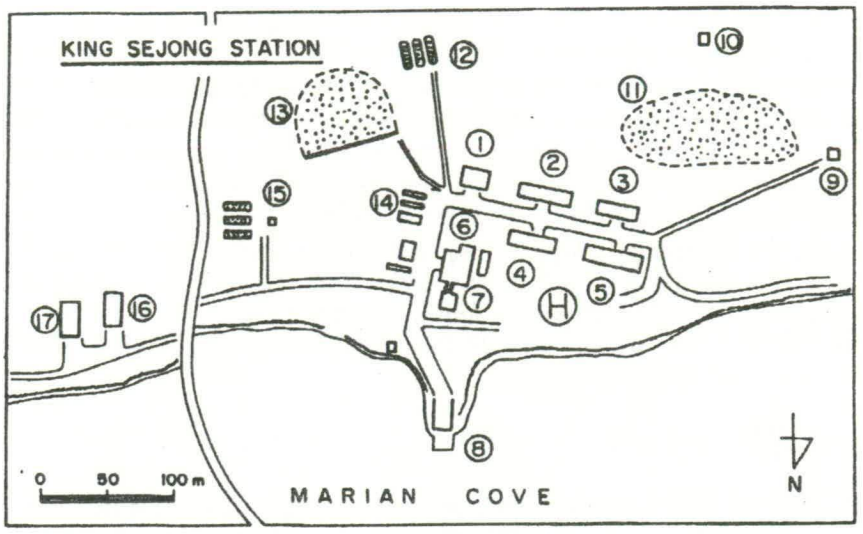
Two cruise ships and one yacht visited the station last year and there were two American tourists on a Uruguayan military vessel which visited in December. About 200 tourists came ashore but caused no operational problems or environmental impact.

Conclusions

This station carries out a range of scientific work, and is staffed and equipped accordingly. The station is of relatively recent construction, well laid out so that a fire in any one building would be contained, and is kept in good external condition. An incinerator which normally works well and a compactor are in use and waste is dealt with in accordance with the Protocol. More attention to securing waste awaiting collection for processing and earlier segregation is recommended. Improvements could be made to fuel containment and pipework, matters about which the Base Commander was aware and had plans to deal with during the coming winter.

Overall, the team was satisfied that the station was being operated with care for the environment as a major concern.

THE KING SEJONG STATION LAYOUT



(1)	Maintenance shop – Incinerator equipped	(10)	Upper Atmospheric observatory
(2) & (3)	Dormitories	(11)	Natural lake
(4)	Living building – Medical clinic located	(12)	3 Fuel tanks
(5)	Research building – Radio room located	(13)	Man-made pond
(6)	Machinery building – with two desalinising systems equipped	(14)	Survival huts (Containers)
		(15)	3 Fuel tanks
(7)	Power plant	(15)	Storage building
(8)	Pier	(11)	Garage
(9)	Geophysical observatory	H –	Heliport

FARADAY (UNITED KINGDOM): visited 16 January 1993

Physical Description

Faraday Station is located on Galindez Island, in the Argentine Islands group, off the West coast of the Antarctic Peninsula at position 65° 15´S, 64° 16´W. The station is operated by the British Antarctic Survey (BAS), and its primary aim is scientific research. The nearest base is the US Palmer Station, about 60 kilometres away. The site was first occupied in 1947 when a small building, Wordie House, was built about one kilometre from the present station; this old building is being restored. Construction started on the present site in 1953 and there have been two major expansions; the last in 1978–79. The present number of main buildings is four. The most recent is a store shed built in 1989. The area covered by the station is about 0.2 square kilometres. A hut used as a refuge is on Rasmussen Point, on the mainland six kilometres away. Emergency depots exist at various sites nearby, eg on Petermann Island. The main buildings and the smaller huts housing scientific instrumentation are well kept. The station has a 20-foot wooden jetty usable by small craft.

Personnel/Military Support

At the time of the visit there were 18 individuals at the station. This increased to 22 on the next day. Personnel are all civilians with no military support. In summer the scientific to logistic ratio is typically 8:10, in Winter 4:6. The station can comfortably accommodate 24.

Summer tours are of the order of four/five months and longer-term tours about 28 months. All personnel receive specific training both in the UK and on site on first aid, health and safety, field safety, fire-fighting and environmental protection. They are also subjected to medical and dental screening before leaving for Antarctica. Briefings on the Antarctic Treaty are given and the relevant documents are kept at the station. Scientists are generally recent graduates.

Scientific Research

The main lines of research at Faraday are meteorology and upper atmospheric science. There is also a seismograph, a magnetic observatory, Very Low Frequency (VLF) recording, a tide gauge with the longest continuous set of data for Antarctica (since 1947) and a meteorological station.

Meteorological data are fed into the world meteo network. There is scientific co-operation with New Zealand and there has been with the USA in the field of VLF research, and with the Netherlands on biology. There are occasionally exchange scientists (two Dutch scientists arrived the day after the Inspection).

Logistics/Equipment

Potable water is obtained by reverse osmosis; water can also be obtained by melting snow or ice. The reverse osmosis plant can produce up to 2,880 litres per day. Electricity is generated by three 120 kilowatt VA diesel generators, one in operation, two in reserve. Co-generation is not used nor are alternative energies. The exhaust of the generators is neither filtered nor monitored. The average yearly consumption of diesel fuel is 120 tonnes.

Diesel is stored in two steel sectional tanks; both have liners, one in steel and one in neoprene. Maximum fuel storage is 195 tonnes. There is no protection for spills from damage to tanks or piping or from valve malfunctions. There is no bunding around the tanks and it would be difficult to provide containment facilities given the rocky location of the tanks. The smaller tank is at times kept partly empty for a reserve capacity and a bladder tank, not normally used, is also available in an emergency.

Two oil spills occurred in the recent past, one of 1 tonne and one of 1.5 tonnes. The first occurred because the flexible liner split in the 45–tonne tank, the second because of overfilling the 150–tonne tank. The station stores other fuel: one tonne of petrol for snowmobiles and outboards in 200 litre-drums, and two tonnes of aviation fuel for heating and cooking. Only very small amounts of hazardous chemicals for laboratory use and photo-processing chemicals are held.

Fuel is pumped from the tanks to the generator shed through steel piping with manually-operated valves. Station re-supply from ship is done using flexible fuel line in 25–metre sections or by using a barge-mounted bladder to bring the fuel near the shore from where it is pumped into the tanks; during these operations there is continuous monitoring and the piping is blown through afterwards. Fuel management is the responsibility of the diesel mechanic. Fuel pumping systems and storage tanks are monitored on a daily basis but continuously during re-supply. All monitoring is done manually.

Transport and Communications

The only land vehicles at Faraday are two snowmobiles. There are four 12–foot GRP dinghies with outboards. There are no aircraft or helicopter facilities, nor established helipad, but there is a flat area used as a landing area. The maximum number of movements by helicopter to or from the station per year has been 20, but 10 is normal. Re-supply is done by sea, normally twice per year, in early December and late March, with supplementary logistic support by *HMS "Endurance"*.

No new communication facilities have been installed since the 1992 SCALOP Exchange of Information.

Firearms and Explosives

There is one Lee Enfield .303 rifle with a maximum of 50 rounds, used to put down injured animals. Rifle bolt and ammunition are kept securely by the Base Commander.

Environmental Protection

(i) <u>Services and waste management</u>

The station uses the BAS Waste Management Handbook, with a supplement for this station. Waste management is the responsibility of the Base Commander. Personnel receive training in waste management both in the UK and on base. With few exceptions waste is retrograded either to the Falkland Islands or to the UK for final disposal. There is no sewage treatment and sewage and grey waters are discharged directly into the sea at the site of the jetty. No incinerator is used and occasional open burning is undertaken. This will be phased out in the near future.

(ii) Emergency response capability

The station does not have a fire emergency plan as a single document, but fire-fighting instructions are posted around the station. There is a fire detection system, extinguishers of different types are available throughout the station, and a sea-water pump is installed at the slipway. Personnel receive fire-fighting training in the UK prior to departure and fire-fighting exercises are held at least once a month. This station implements the BAS practice of rotating base members on night watch duties.

There is a small surgery, equipped for minor operations, with a resident doctor and equipment such as a defibrillator and an X-ray machine. If transport can be provided or a patient can be brought to the station, medical assistance could be given.

At the time of this Inspection, the station received equipment for emergency response in case of oil spills, ie high capacity pumps, booms, absorbent materials and transportable tanks. Training of personnel in accordance with an oil spill contingency plan using these materials will start soon. However, given the absence of craft on station, it will not be possible to intervene in case of oil spills in the vicinity.

(iii) Environmental Impact Assessment (EIA)

An EIA was prepared for the construction of the store shed in 1989. EIA will be prepared as appropriate for new facilities or activities.

The only environmental monitoring in progress is related to assessing the impact on the marine environment of the oil spills mentioned above. There is no environmental monitoring in a broader sense.

(iv) Conservation of flora and fauna/protected areas

Personnel are instructed on environmental protection and the conservation of flora and fauna. There are no protected areas in the immediate proximity.

Tourism and NGO Activities

Faraday is visited by 450–500 tourists per year, from between four and eight cruise ships and 10 to 12 yachts per year. There are no formal procedures for tourist visits though Tour Operators must obtain permission to visit Faraday from BAS Headquarters in the UK before the start of the season, and give an advance warning to the station of 48 hours. To date tourist visits have not created particular problems.

Conclusions

Faraday is a comparatively small research station. It is well run and well kept by competent and well trained personnel. The fire protection measures are of high calibre and provide a good example which could be followed elsewhere.

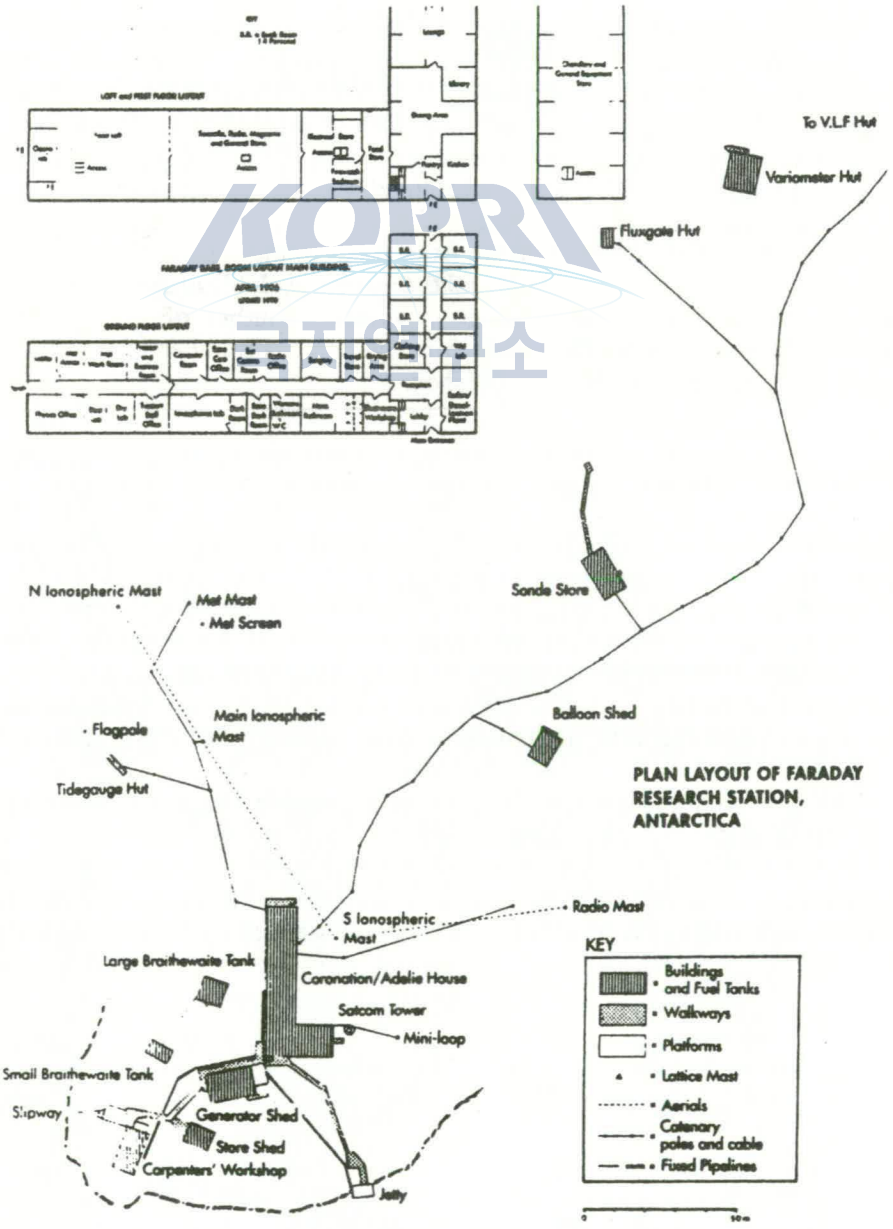
The major concern is the type and location of the bulk fuel tanks and their pipework. The tanks are elderly and probably no lining can make them much more leak-proof. Their location makes it difficult to construct containment bunding. It is recommended that BAS consider replacing the existing tanks and their pipework with modern cylindrical double-walled steel tanks.

A minor further point is that petrol should not be stored in close proximity to the main buildings.

Postscript

Since the Inspection the British Antarctic Survey has indicated that it intends to 'mothball' Faraday by the end of the 1995/96 season. Certain scientific studies will be transferred to the Halley and Rothera stations with some automatic recording instrumentation retained at Faraday.

FARADAY STATION LAYOUT



ROTHERA (UNITED KINGDOM): visited 18 January 1993

General

Rothera Station is located at 67° 14'S, 68° 07'W on Rothera Point, Adelaide Island, off the west coast of the Antarctic Peninsula. This year round station is operated by the British Antarctic Survey (BAS). Its main purpose is the support of scientific field activities.

Physical Description

The nearest bases are the Chilean station 'Carvajal' about 55 kilometres away, also on Adelaide Island, and the Argentinian station 'San Martin' 75 kilometres away on Debenham Island. The construction of the station began in 1975, with a major expansion in 1976. In 1989–91 a hangar, a crushed rock runway and a wharf were constructed and in 1990–91 a 360 square metre arched metallic storage building was built. The main building housing the living facilities and most of the other buildings are of prefabricated insulated plywood construction.

The six major buildings, including the aircraft hangar, occupy an area of about 0.5 square kilometres. They are all in good condition, clean and well kept. The runway is 900 metres long and 45 metres wide and is made of crushed rock. On its southern side are the buildings of the station and on the opposite side the hangar and the main fuel storage facility. The wharf is constructed of interlocking sheet piling driven into the seabed, anchored to the bedrock and filled with concrete and rock; it has a length of 60 metres and can accommodate a 10,000–tonne ship.

Four DHC-6 Twin Otters operate from Rothera during the summer. Larger aircraft could also operate from this runway. The wharf and the airstrip make Rothera Station the hub of BAS field operations in the Antarctic Peninsula area. A large number of geological, geophysical and glaciological field activities are supported from here and a number of field huts, fuel dumps and automatic weather stations have been established.

Personnel/Military Support

At the time of the visit there were 81 individuals working out of Rothera. Three of them are military, aircraft mechanics seconded to BAS, to maintain the aircraft. Thirty-four personnel were scientists and 47, including the doctor and mountaineering assistants, provide logistic and other support. Twenty-eight staff were present on the station, with 53 in the field; these are typical and indicative numbers, because they change frequently. The maximum capacity of the base is 76. The number of personnel on base during summer may reach 70, while the wintering complement is about 15, with a tour length of the order of 30 months. Summer tours are of the order of five months.

BAS personnel receive specific training both in the UK and on site on first aid, health and safety, fire-fighting, environmental protection etc. They are also subjected to medical and dental screening before leaving for Antarctica. Briefings are given on Antarctic Treaty matters and the relevant documents are available at the station. The education level of the scientific personnel at this station is quite high: most of them either have doctorates or are working towards them.

Scientific Research

The main scientific programmes are in geology, geophysics and glaciology; a certain amount of research is also undertaken on freshwater and terrestrial biology. Several laboratories exist; in general, data and samples are collected here for subsequent study and analyses in the UK. A meteorological station collects data which are fed into the international meteorological network. A high-resolution satellite meteorological receiver for research use is about to be installed.

There are international co-operative activities: Rothera-based scientists participate in an EC-funded programme in glaciology, while geologists work with the USA and New Zealand teams in Marie Byrd Land; two South African scientists were working at the station after a period of field work on freshwater biology. On the average there are about six exchange scientists per year at Rothera.

Logistics/Equipment

Potable water is produced by a reverse osmosis plant capable of producing about 10,000 litres per day. Water can also be obtained from a small lake of glacier run-off or by melting snow or ice. Power is produced by three 200 kilowatt VA diesel generators, one in operation, two in reserve. Heat exchangers are being installed on water boilers. Alternative energy sources are not used. The insulation of the buildings is so good, apparently, that the only heating need in some buildings is that from the lighting system.

No hazardous liquids are kept at the station apart from battery acid and photographic chemicals, an annual inventory of which is made. The fuel storage facility for diesel and aviation fuel is very well planned and laid out: it is located on the opposite side of the runway from the station buildings, and consists of six 245,000–litre single-wall steel tanks, surrounded by a primary berm. This discharges into another, larger leak-proof berm capable of containing the full contents of all six tanks.

Petrol for vehicles and snowmobiles is kept in 200–litre drums, as is aviation fuel for use in the field.

The fuel storage facility is filled to only half of its capacity; three of the tanks contain diesel fuel, the other three contain aviation fuel. No bladder tanks are used. The fuel inventory at the time of the visit was 455,000 litres of diesel in bulk storage, 12,000 litres of petrol in 200–litre drums and 427,000 litres of aviation fuel in drums, and another 178,000 litres in bulk storage. The pipework for the bulk storage has expansion joints and check valves to prevent spillages. Piping is both overground and underground (heat traced). Transfer is made by pumping as are the ship to shore transfers which use a short length of flexible hose connected to the piping; after these, the hose is blown clean from the ship side.

There is a well documented Fuel Management Plan, a copy of which was given to the Team. The diesel mechanic or aircraft mechanic are responsible for day-to-day fuel management, while overall responsibility rests with the Base Commander.

Drums with aviation fuel are stored between the track going from the wharf to the base and the runway. It is not an ideal location, even if it is probably the only possible one. Perhaps a high visibility fence could be installed to make drivers well aware of the presence of the drums.

Transport and Communications

This station has a large number of land vehicles: fifty snowmobiles, two snowcats, one tracked GP vehicle, one tracked crane, two forklifts, one wheeled GP vehicle, one bulldozer, one snowblower, one grader, two 4 x 4 buggies, three 4 x 4 all terrain vehicles. There is one kilometre of graded crushed rock track, in daily use in summer. Small craft include two inflatables and one semi-rigid inflatable, all with outboard motors. Four Twin Otters are based at Rothera but no helicopters. There is no separate helipad.

The wharf receives around 12 ships per year, while the airstrip has about 700 movements per season (mid-October to early March). There are occasional visits of aircraft from other bases, about 20 per year.

Almost all re-supply is done by ship in November/December, with bulk aviation fuel and some cargo, and in March with cargo and other fuels. *HMS 'Endurance"* also visits twice with limited amounts of cargo. Only occasionally are items flown from Eduardo Frei Station or Stanley.

Firearms and Explosives

The station has one Lee Enfield 0.303 rifle used to take seals for dog food and two 0.45 revolvers to put down wounded animals. The bolt of the rifle and the ammunition are kept securely by the Base Commander.

Ten tonnes of ammonium nitrate/diesel explosive and 100 kilograms of primers and detonators are kept respectively in a dump several kilometres away on the glacier and in a specially built explosive store well separated from the base buildings; they are used for geophysical and glaciological research.

Environmental Protection

(i) Services and waste management

A Waste Management Plan and a Waste Management Handbook have been produced and a copy of the Plan was given to the Team. Waste management is the responsibility of the Base Commander in summer and of a designated person in winter. Personnel receive training in waste management both in the UK prior to departure and on base. Most of the waste is retrograded either to the Falkland Islands or to the UK for final disposal. Residues of avian products are boiled, macerated and discharged with grey waters. There is no biological or chemical sewage treatment plant: sewage and grey waters are macerated and subsequently discharged into the bay to the north of the base.

There is no incinerator; limited open burning is still carried out of large wooden cargo boxes and the resulting ashes are drummed and retrograded to the Falkland Islands. The "housekeeping" at this station is reasonably good, with the possible exception of the area where some old drums are stored; this area is being cleaned up with the use of the recently arrived drum-compacting machine.

The only environmental incident reported recently was a spill of 800 litres of diesel fuel which occurred in 1991 because of a split hose joint. The occurrence was duly reported.

(ii) Emergency response capability

Elaborate fire protection measures exist throughout the buildings: smoke detectors, fire alarms and extinguishers of different types are installed. A Halon system exists in high-risk areas (communication rooms, generators) and a sprinkler system is being installed. Fire-fighting exercises are held regularly. A base member is always on night watch and this is a particularly commendable practice.

The station has a well-equipped surgery, with a resident doctor and an ample supply of drugs; surgery up to appendectomy could be performed and medical help could be given in case of medical emergencies within the constraints of available transport.

(iii) Environmental Impact Assessment (EIA)

An Environmental Impact Assessment (EIA) was prepared for the construction of the runway and was circulated among Antarctic Treaty Parties. BAS provided support for an observer from the UK's environmental community to view the construction of the runway and associated developments. In case of new construction or activities, EIAs would be produced by BAS.

(iv) Conservation of flora and fauna/protected areas

An SSSI (No. 9) lies about 0.5 kilometres from the station buildings: its boundary is clearly indicated by yellow painted drums. Regular monitoring of flora and fauna is carried out in the surrounding area. In particular, lichens are monitored for the presence of heavy metals. Birds and lichens are monitored in the SSSI. A number of moss banks exist near the station; they are marked as study sites.

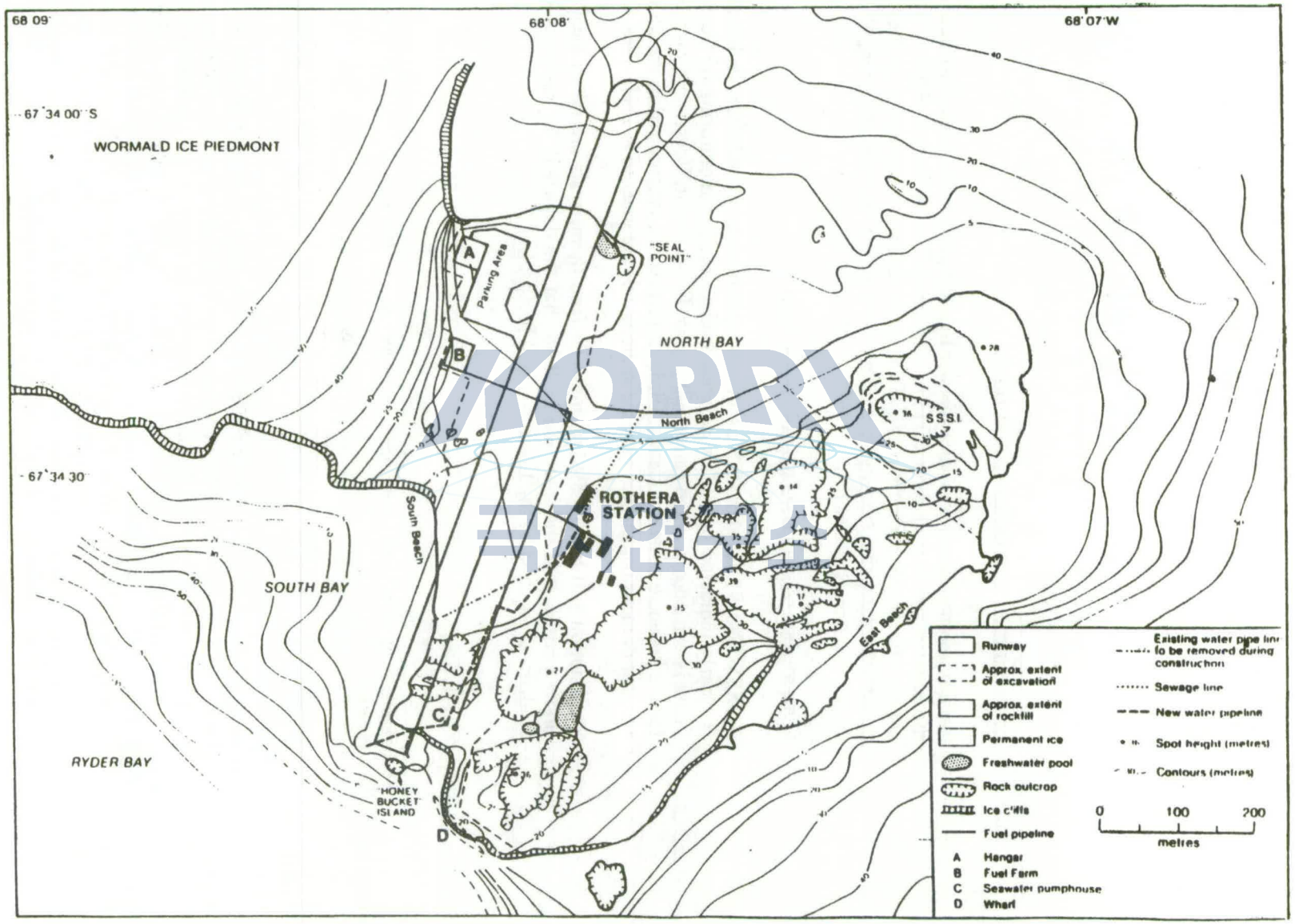
This station still has 19 Sledge dogs. To feed them, seals are taken each year under permit. It is the intention of BAS that the dogs will be removed from Rothera as required by the Environmental Protocol.

Tourism and NGO Activities

No tourist visits or NGO activities were reported. BAS does not provide facilities for Tourist or NGO Operators.

Conclusions

The Inspection Team received a very positive impression of this station. It is well planned, well organised and well maintained; some of the installations, like the bulk storage facility, are good models of how such a facility should be built in Antarctica. The care given to fire protection, even if prompted by the type of construction of the buildings, is impressive. The written documentation of important activities, such as fuel management, waste management, runway safety procedures, etc, is an example of good management. The Antarctic Treaty and its Protocol on Environmental Protection principles are implemented correctly. It is suggested that flight operations would be improved if the ground controller could be housed in a place where the full length of the runway can be seen easily; with present facilities, either end of the runway is blind to the ground controller.



ROTHERA STATION LAYOUT

GENERAL SAN MARTIN (ARGENTINA): visited 23 January 1993

General

San Martin Station is located on Debenham Island, near Cape Calmette on Marguerite Bay, between Adelaide and Alexander Islands at position 68° 08'S, 67° 06'W. The year round station is operated by the Direccion Nacional de la Antartica, which is an Agency of the Argentine Ministry of Defence. The primary purpose of the station is scientific research, with the secondary tasks of surveying and of familiarising personnel with Antarctic conditions.

Physical Description

The nearest station is Rothera, 75 kilometres away on Adelaide Island. The construction of this station began in 1951 with a small building which no longer exists. The station remained open until 1960; it then closed and was reopened in 1975 with the construction of the building now used as emergency accommodation and as scientific laboratory. The building now housing the main accommodation was built in 1982. There are seven buildings, built of timber with metal cladding; they are painted red and are generally well kept. The area covered by the station is around 0.2 square kilometres. There are no plans for new buildings but only for the improvement of existing scientific facilities.

San Martin supports several small refuges in the area, each of which can accommodate four persons. Some refuges were established on the glacier, but their present status is unknown. These huts contain emergency food, fuel and bunks.

Personnel/Military Support

The station San Martin is operated by the military: the Base Commander is an Army Officer and the majority of the personnel are either Army or Air Force. Logistic support is given by the Argentine Navy with the ship *ARA "Almirante Irizar"* (ARA = Armada de Republica Argentina).

The maximum capacity (apart from in emergency situations) of the station is 20. At the time of the Inspection there were 16 on station and none in the field. Of these, three were civilian and 13 military, most of them Army, apart from two Air Force meteorologists. All staff winter-over and there are no summer-only personnel. The length of a tour of duty is one year. Appropriate training is given in Argentina, the military personnel in Bariloche for cold weather techniques and the scientific personnel at the Instituto Antartico Argentino. Training for environmental protection and survival training is given on base. All personnel, both civilian and military, are medically and psychologically screened prior to departure for Antarctica.

Instruction on Antarctic Treaty matters is given on base and the relevant documents were available at the station. The senior scientist on base is usually a graduate electronic engineer, while his two assistants may have the same specialisation at a lower level.

Scientific Research

This station conducts programmes in the following areas: geomagnetism, with continuous recording on three components, including micropulsations, riometry, ionospheric soundings and Very Low Frequency recording. The station is equipped with instrumentation necessary for the collection of data, but their subsequent analysis and interpretation is undertaken in Argentina.

The station takes part in the Solar Terrestrial Energy Programme (STEP). Meteorological data collected at the station are reported to Marambio.

There are no exchange scientists at San Martin.

Logistics/Equipment

Water is obtained by melting snow or ice and seawater is used for the toilets. When it is difficult or dangerous to obtain ice, a reverse osmosis plant with a production capability of 1,400 litres per day is used.

Electricity is generated by one out of three Deutz 25 kilowatt diesel generators. The exhaust from these is neither monitored nor filtered. At the time of the Inspection one of the generators was packed for return to Argentina for refurbishing. The total yearly consumption of diesel fuel is between 45,000 and 50,000 litres of which 25,000 to 30,000 are for electricity production, and the balance is for heating. Very little is used for vehicles. LPG is used for cooking. Alternative energy sources are not used.

The station has a maximum storage capacity of 60,000 litres of diesel fuel, 12,000 litres of petrol and 5,000 litres of aviation fuel; there are also 123 bottles (45 kilograms each) of LPG. Quantities at the time of the Inspection were respectively 17,000 litres, 8,000 litres, 2,400 litres and 53 LPG bottles. Fuel is stored in 10,000 litre bladder tanks, seven of which are in use and three are kept in reserve. They are located on a concrete hardstand. The bladder system does not have any protection against accidental spillages. The only possible measure is the availability of three empty bladders for emergency transfer. The Base Commander told the Inspection Team that it is proposed to phase-out the bladders. It was planned that the *ARA "Almirante Irizar"* would deliver three steel 10,000 litre tanks during her next visit. These, together with others to be provided later, would in time replace the bladders. Three such tanks will occupy the space of one bladder on the hardstand. Protection measures to be adopted for the new tanks were not known to the Base Commander.

Fuel is pumped from the bladders via flexible hoses with manual valves; every twenty days a tank close to the generators and the heating burners is filled. There are daily visual inspections of the bladders and fuel lines and weekly snow-clearing from the bladders in winter. The Base Commander is responsible for fuel management.

Transport and Communication

The station has one wheeled truck, one Muskeg tractor, seven Skidoos and two Yamaha snowmobiles; there are no roads, only a rough track within the station area.

There is no jetty or landing stage. Landings occur on the beach. Three inflatable boats with 15 HP outboards are available. There is a helicopter landing pad covered with sheets of aluminium from which a Sea King or a Puma helicopter can be operated. There are about 70 helicopter movements per year, most of them as part of the annual re-supply of the station by the *ARA "Almirante Irizar"*. This usually occurs in February or March and the supplies are transferred by helicopter.

The communication facilities do not differ from those reported in the yearly information report; it was noted that marine VHF channel 16 was not available.

Firearms and Explosives

There are no arms, ammunition or explosives on this base.

Environmental Protection

(i) Services and waste management

There is no formal written document for waste management. The Base Commander has issued written instructions about waste collection and separation and every month a report on the quantities of the various waste categories is sent to the appropriate Argentine authority. All the management and disposal of waste, from its collection to its eventual retrograding, comply with the Environmental Protocol. Sewage and greywater are discharged untreated into the sea. Open burning was still used but an incinerator was expected to arrive shortly; some waste fuel is used during open burning. A waste compactor has been installed recently and appears to give satisfactory service. Some waste has been used for landfilling capped with concrete under the area of hard standing used for fuel storage.

The station is well kept and general housekeeping is good, even if the age of the structures is apparent in some areas.

(ii) Emergency response capability

There is no installed system of smoke detectors or of sprinklers, but there is a detailed written fire emergency plan and an adequate number of fire extinguishers. Personnel are given fire-fighting training and fire-fighting exercises are held, even if not frequently. A member of the station is on night watch every night and this is a commendable fire protection practice.

The station has a surgery and a resident doctor. The supply of drugs is ample and there is a secondary surgery in the emergency accommodation. It would be possible to perform some emergency surgery even if the space available is small and probably difficult to keep sterile. The station could provide outside emergency medical support if transport were available.

There is no written plan for dealing with oil or chemical spills. No absorbent materials are available, but various portable pumps could be used and personnel have been trained to deal with spills. There were no traces anywhere of fuel spills of any size, nor were any reported to the Inspection Team.

(iii) Environmental Impact Assessment (EIA)

No EIA was prepared for this station. There is no systematic environmental monitoring, apart from some seawater monitoring done by scientists on board the *ARA "Almirante Irizar"*.

(iv) Conservation of flora and fauna/protected areas

Personnel are briefed on the environmental protection and the conservation of flora and fauna. There are no penguin rookeries in the near vicinity; one of Adelie penguins is 20 kilometres away, and one of Emperor penguins in a Specially Protected Area (SPA) on Avian Island about 80 kilometres away. On Stonington Island there is East Base, an historic monument.

Tourism and NGO Activities

None reported at this station.

Conclusions

This is a small station performing a limited number of scientific tasks. It is well kept and well run. The absence of oil spills of any size in the fuel storage and generator areas was remarkable. The team was also impressed by the measures to contain the effects of any fire: there is emergency accommodation in a well separated building which was the previous main accommodation. In this building bunks, stores, drugs and radio equipment are kept. The main food store is also located in another separate building to which the electricity supply is cut, when not specifically needed, to avoid the only likely cause of fire.

STONINGTON ISLAND BASES (UNITED KINGDOM AND UNITED STATES): visited 29 January 1993

General

The abandoned UK Base E and the US East Base are situated on Stonington Island (S 68° 11', W 67° 00') in Marguerite Bay. The two bases are separated by about 200 metres. Base E was closed in 1975 and the American East Base used by the United States Antarctic Service Expedition (1939–41) and the Ronne Antarctic Research Expedition (1947–48). East Base was then used by the UK until 1975. East Base has since been declared an Historic Monument (No. 55) and an American restoration team worked at the station in the 1991/92 season, completing an initial clean-up of the site and establishing a small museum in one of the buildings.

At the same time two BAS personnel cleaned-up the British station and removed hazardous items. They also marked with low walls of stone the outline of the hut (Trepassey House) used in the late 1940s by Sir Vivian Fuchs and his colleagues. This lay towards the southern shore of the island between Base E and East Base.

British Base E

(i) Physical description/environmental impact

This abandoned station consists of two huts, together with steel mesh pens for dogs, a steel lattice meteorological tower and concrete bases for fuel tanks etc. The huts are in good condition although the timber of which they are constructed has no protection. Most of the windows have been boarded over and access is clearly marked. The larger two-storey hut housed the main accommodation. It remains largely windtight and watertight as does the smaller generator shed. Although one generator remains in place, there are no bulk fuel storage facilities; only a few jerrycans in the generator shed were labelled as containing fuel and oil for the generator. There are notices on the solid fuel stove in the former living room and the solid fuel cooker in the kitchen warning of possible danger from carbon monoxide poisoning should these be used. There is little local wildlife, to which the remains present no hazard.

(ii) Tourism/NGO activity

There is no evidence that the site has been visited by tourist or NGO groups, but it is visited regularly by members of the nearby Argentine station, San Martin. There was evidence of this such as tins of food. Personnel from the UK Rothera station also visit during winter if there is good sea ice. Several such visits during the last Antarctic winter were recorded in the visitors' book. There were no signs of vandalism or theft.

US East Base: Historic Monument (No. 55)

(i) Physical description/environmental impact

The major remains are three huts in close proximity. All appear to be windtight and watertight. The entrance to the smallest hut is secured and clearly marked "no admittance". All but one entrance to the largest hut are secured and, on entering the hut, there is a very clear warning that most of the hut beyond a partition with a viewing window contains hazards to human health (the building was used by the British to store and cut up seal carcasses for dog food) and should not be entered. The third hut is marked as a museum. It contains items recovered at the site. These are neatly displayed on shelves and benches behind recently installed guard rails. Around the buildings are dumps of tinned food etc in boxes and casks dating from 1941, and some loose timber. At the time of the Inspection there was a strong smell in this area and it would seem sensible to clear these dumps and further tidy loose materials. About a hundred metres to the west of the buildings are the remains of two tracked vehicles, an army tank and a tractor, and to the north of these is a sign again in four languages warning of an area in which there are items hazardous to humans. There do not appear to be any remaining fuel or chemicals on the station nor is there any apparent hazard to wildlife.

(ii) Tourism/NGO activity

There is no sign that the site has been visited by tourists or NGOs, although the visitors' book indicates that personnel from the Argentine station San Martin and the UK Rothera station have been there in the last year.

(iii) Conclusions

It is understood that the US National Science Foundation (NSF) intends to undertake further restoration and clean-up on this site, but the work done so far has been neatly and sympathetically carried out and is to be commended.

PALMER STATION (UNITED STATES): visited 2 February 1993

General

Palmer Station is located on Gamage Point on the south coast of Anvers Island, in the Palmer Archipelago at 64° 46'S, 64° 04'W. This year round station is operated by the National Science Foundation (NSF) and the US Antarctic Program. The main aim of the station is scientific research.

The Inspection Team arrived by boat from *HMS "Endurance"* on 2 February 1993 and was welcomed by Dr P A Penhole and Ms A Peoples, who dealt with the Team during the Inspection.

Physical Description

The station is sited on a narrow rocky point to the west of which is a safe anchorage for large vessels. The original station was established in 1965 about one kilometre from the present site which was selected in 1970 to allow the construction of a larger station with a jetty. The station does not support remote huts or refuges but a number of caches of food and fuel are located within about two kilometres of the station. The area covered by the station is approximately 0.2 square kilometres.

There are two major buildings and a number of minor ones, plus shipping containers. The state of the buildings varies with their age. Some of them need outside refurbishing; the interiors are well kept and are adequately and comfortably equipped. There are some small additions in progress at present, but no major building programme is foreseen in the short term. The last major building activity was the re-skinning of the main building in 1989.

The station has a number of very well equipped scientific laboratories and scientific support laboratories, computers, repair shops for all types of equipment and an aquarium with large holding tanks for krill.

Personnel/Military Support

At the time of the Inspection there were 39 individuals on station; field work is limited to day trips. Eight staff were spending a period on the research vessel *RV "Polar Duke"*. All personnel are civilian. Of the 39 individuals, 15 were scientists, 22 logistic support personnel, one from the National Parks Service and one artist. The maximum comfortable capacity of the station is 43. The average number at this "year round" station is 40 in the October/March period, reducing to 13–14 in June/July. The maximum tour length is one year with rolling replacement of personnel; tours for scientific staff range from one to six months. This is made possible by the 10 visits each year of the *RV "Polar Duke"* at approximately six-week intervals. This permits adjustment of the duration of tours to meet the needs of individual projects.

The scientific background of research personnel ranges between the project leaders who have PhDs and 15 or more years of experience, and others who may be graduates or undergraduates.

Personnel bound for USAP stations receive training in the US on a number of subjects, such as cold water survival, glacier search and rescue, fire-fighting, oil spill response, hazardous material spill response and environmental protection. Some of this training is supplemented with more specific training on base.

Medical and dental screening of personnel is performed by the individual's own practitioner following a schedule prepared by the US Navy; subsequently the findings are scrutinised by Navy specialists. For winterers, there is also psychological screening carried out by US Navy psychiatrists.

Scientific Research

Palmer Station's purpose is scientific research. The main fields are environmental research, physical and biological oceanography, krill population research, fish physiology, ultra-violet measurement and UV biological effects, hydrocarbon chemistry (as a consequence of the *"Bahia Paraiso"* accident in January 1989), atmospheric sciences and meteorology. The station has a number of dedicated science facilities. Palmer scientists participate in a number of international research programmes, though at the time of the Inspection there were no foreign scientists at the station.

Radio-isotopes, in particular Carbon–14 and Tritium, are used; they are used in microcurie amounts up to a maximum of a few microcuries, are kept under strict control, both physical and administrative and are retrograded to the USA after use or at the end of the programmes.

Logistics/Equipment

The station is re-supplied by the *RV "Polar Duke"* which visits the station every six weeks. A computerised stock control system is used for all items, including hazardous items which are stored in a dedicated area.

Power is generated by one of two 250–kilowatt diesel generators, with a third 100–kilowatt generator held in reserve. The consumption of diesel fuel averages 390,000 litres per year. A minimal use of cogeneration is made in pre-heating water for drinking water production. Alternative energies are not used on the station, but small wind generators are used in some research projects. Generator exhaust is neither filtered nor monitored.

Water is produced by three flash evaporators and a reverse osmosis plant. Each evaporator is capable of producing about 1,900 litres per day, but in practice no more than 3,000 litres/day can be obtained from the three machines. The reverse osmosis plant can produce 7,900 litres/day. The preferred source is water pumped from a small lake which catches the glacier melt and can be used from November till early February.

Transport and Communications

The station has a mobile crane, one fork lift truck, two front loaders, two small Suzuki 4x 4 vehicles and two snowmobiles; there is a rough track of about 500 metres between the station buildings. Eight inflatable boats with outboards and a small plastic rigid boat are used for coastal field work. The station has a jetty which can accommodate vessels up to seventy metres in length.

There are neither fixed nor rotary wing aircraft at this station. Helicopters up to the size of a Sea King can land near the jetty and there is an ice runway on the glacier near the station where Twin Otters can land at some times of the year. This year there have been two aircraft movements.

DFM–(diesel fuel marine) is stored in two steel tanks each with the capacity of 468,000 litres, while petrol for the outboards and JP–8 for aircraft is kept in drums. No bladder tanks are used. The steel tanks are single-walled, are located on rock and do not have a surrounding berm. The only means of reducing fuel spills is fuel transfer from one tank to the other. This is possible because they

are always kept no more than half full. All fuel transfers within the station are by gravity; one pump is available if needed. Fuel piping is steel, and above ground with the exception of a short section where it crosses the track. The piping is heat traced but this practice is likely to be discontinued. At the time of the Inspection, more piping and fuel transfer facilities were being installed. The isolation valves are manual.

Firearms and Explosives

The station holds one Ruger .22 rifle, two shotguns and two .45 pistols and a total of 300 rounds and cartridges. The weapons and their ammunition are safety kept. There are no explosives. There appears to be no reason why these weapons are kept.

Environmental Protection

(i) Services and waste management

The station has a Waste Management Plan. This is under revision to take account of the Environmental Protocol. There are instructions on waste management and personnel receive specific training. Wastes are dealt with in accordance with the Protocol. They are separated at origin and retrograded when necessary either to Punta Arenas or to the USA via McMurdo Station. Palmer Station made use of landfills in the past, but the practice was discontinued some years ago.

Sewage and grey waters are only treated by maceration and the effluent discharged into a high dispersion area not far from the jetty. No effluent monitoring is undertaken.

The station discontinued open burning five years ago and there is no incinerator on site. No recycling of waste materials is implemented.

(ii) Emergency response capability

Palmer has a well equipped surgery and a resident doctor. It is possible to perform surgery and medical assistance can be provided subject to the constraints of available transport. The station has a trained trauma team.

All the buildings of this station are equipped with smoke detectors and the fire-fighting facilities and precautions are very detailed and extensive. A sprinkler system is installed in a number of areas, fire extinguishers of the appropriate types are present in sufficient numbers and in all areas. There is a regularly updated fire emergency plan and personnel receive fire-fighting training, some of them at specialised institutions in the USA. Fire drills are held monthly. Commendably a night watch is implemented.

The station has a Fuel Management Plan, on site responsibility falling on the facilities engineer. In October 1992 there was an oil spill of more than 3,000 litres which has already been reported to SCALOP. The station has an oil and chemical spill contingency plan which is revised annually; also held on station is material and equipment for oil spill control and staff are appropriately trained.

(iii) Environmental Impact Assessment (EIA)

EIAs have been prepared for some minor construction projects. In case of new construction or activities they would be prepared by the NSF.

(iv) Conservation of flora and fauna/protected areas

In the vicinity of Palmer there is SPA No. 17, Litchfield Island, which is clearly marked; station personnel enter the area to conduct surveys every two years. Personnel are adequately trained in environmental conservation matters.

Tourism and NGO Activities

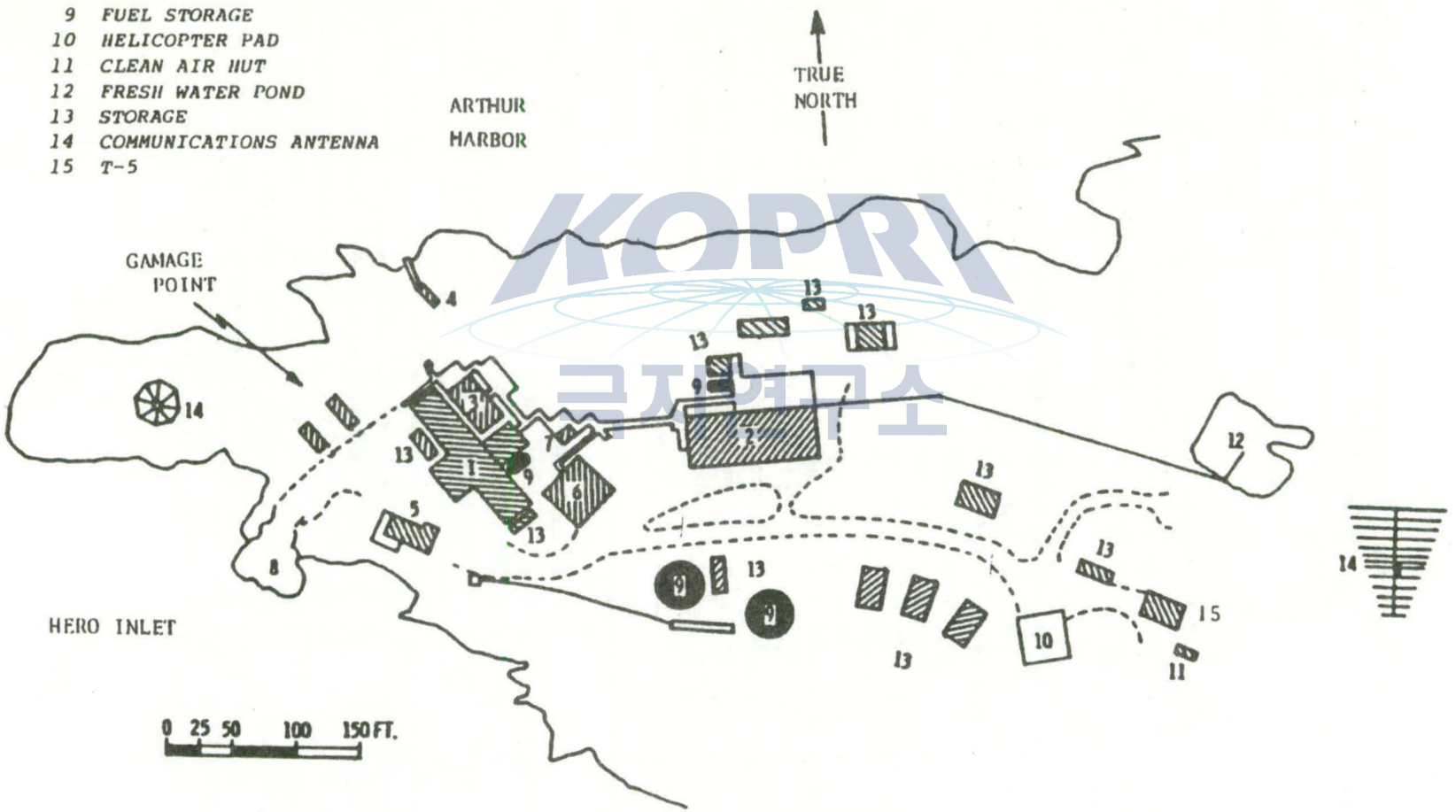
Tourist visits are common at this station: on average 1,400 tourists visit each year on nine to 12 ships. The station gives organised tours and provides two guides on Torgensen Island. Before tourists go ashore a briefing is given on the tour ship (the Inspection Team had the opportunity of being present on the *MV "Explorer"* when this happened). The cost in man-hours of dealing with tourism is high: during a four-hour visit, 40–50 man-hours of base personnel time are needed. However, since this can be planned in advance, with visits approved several months earlier, it is not a great problem. The environmental impact of tourists at this station is considered to be negligible. A meeting between the NSF and tour operators is held every year in Washington, to review experience and discuss future programmes. The station has the policy of not accepting tour ships carrying more than 130 passengers, nor of accepting vessels which have not received prior approval.

Conclusions

Palmer Station has an impressive scientific programme, supported by laboratory facilities of high calibre, staffed by competent personnel. Fire-fighting, emergency response, medical emergency response and oil spill response capabilities appear to be of a high level, and careful planning effort has not been spared.

Equipment and materials stores are well planned, well organised and well inventoried. General indoor housekeeping is good. Fuel storage in the two steel tanks is protected against catastrophic oil spillage only by an administrative safeguard, namely, the transfer of fuel from a leaking tank into the partially filled other tank. This may be adequate in the case of small or slow leaks, but is unlikely to suffice in the case of a sizeable rupture.

Outdoor housekeeping is not at the same level as that indoors; the team understood, however, that efforts were being made by the NSF to remove, where possible, dumps of spare material (timber, pipes etc) from the station and to retrograde former waste dumps either to the US or to Chile.



PALMER STATION LAYOUT

COMANDANTE FERRAZ (BRAZIL): visited 9 February 1993

General

Comandante Ferraz is situated in the north-eastern corner of Admiralty Bay, King George Island at position 62° 05' S, 58° 23'.W. The primary purpose of the station is scientific research and it is operated by the Secretariat of the Interministerial Commission for Marine Resources.

Physical Description

The station lies about 30 metres from the shoreline on the western side of Visca Anchorage, Martel Inlet. The nearest stations, also on the shores of Admiralty Bay, are Machu Picchu (occupied only during the austral summers) which is five kilometres away and Arktowski at 10 kilometres distance.

Comandante Ferraz has one main complex housing the living accommodation, some laboratories and the generating plant. The complex is made up of a large number of linked modules of standard shipping container size, some of which have been enclosed within an area of steel frame and panels. In addition there are a number of independent units housing laboratories, and about one kilometre away along the coast to the west, a few units house upper atmospheric research equipment. The area covered by the main part of the station is about 0.2 square kilometres. Opened on 6 February 1984, the station was occupied only during summers until the winter of 1986. Initially the station consisted of eight modules with expansion to about 30 in the 1984/85 season and in stages to the present total of 53 modules. During the current season a new generator module and a new garage have been constructed and enclosed in about 200 square metres of covered access to the old garage; a new septic tank system and replacement fuel pipework have also been installed. There are no plans for further expansion of the station, only for internal improvements (such as conversion of the units used originally as a garage into laboratories and aquarium) and the construction of a helipad.

Personnel/Military Support

There are 44 personnel at the station, including a team of civilians engaged on the season's building programme. Staff throughout the year include eight Navy personnel, three officers (one of whom is the Station Commander) and five enlisted men, who supply logistic support. In winter there are usually about five civilian scientists rising to about 17 in summer. The station can comfortably accommodate 33 personnel, although eight of these would be in a temporary dormitory. Tours for those wintering last from February or March until November, while summer-only personnel from the Navy spend 3.5 to 4 months at the station, scientists a period of 40 days either at the beginning or end of the season. Navy and wintering personnel are trained in Brazil before each tour, subjects including first-aid, small boat handling, climbing, survival, environmental protection and Antarctic Treaty measures; similar training is given to summer-only civilian personnel but only on every fourth consecutive tour. Navy and wintering personnel are medically and psychologically screened by Navy doctors, while summer-only civilians are screened by their own doctor, the results then being passed to the station doctor. The vessel *NApOC "Barao de Teffe"* which provides logistic support for the station is operated by the Brazilian Navy.

Scientific Research

Programmes at the station include glaciology, upper atmospheric research, and a range of biological investigations mainly into marine biology and chemistry. There are laboratories for biological, chemical, meteorological and upper atmospheric work and a magnetic recording hut. Several programmes contribute to international projects and there are regularly foreign exchange scientists at the station. The qualifications of scientists range from recent graduates to those with PhDs and considerable experience, although occasionally an undergraduate will work as part of a team. No radio-isotopes are used.

Logistics

Re-supply is once a year by the Navy-operated vessel *NApOC "Barao de Teffe"*, with small items and mail being delivered seven times each year by air to Eduardo Frei Station (Chile) for final delivery by helicopter.

Electrical power for light and heat is provided normally by running one of four 150–kilowatt VA diesel generators though at the time of the Inspection, when a large construction programme was in progress, two were running. Generator exhausts are fitted with oxycatalysers and heat exchangers are used to heat the cold water supply. Annual fuel consumption is 240,000 litres of diesel and 3,000 litres of petrol for vehicles and boats. LPG is used for cooking.

Diesel is stored in 17 single-walled tanks with a total capacity of 330,000 litres. At the time of the Inspection, 40,000 litres was held but after refuelling 260,000 litres would be held. A 5,000–litre tank holds petrol. The tanks sit on substantial concrete saddles and all connecting pipework is replaced every two years. There is no containment around the tanks but one tank is deliberately kept empty to allow for fuel transfer. Fuel is brought ashore by barge and flexible hose used to connect to the permanent pipework. The hose is drained by gravity back into the barge after use. Daily manual checks of the fuel system are made. An oil spill contingency plan is currently in preparation after which appropriate materials will be supplied.

Only small quantities of hazardous chemicals are held at the station. These are stored in their original containers and controlled by individual scientists. An inventory is not kept.

Transport and Communications

Vehicles at the station were four skidoos, two muskegs, two bobcats and two bulldozers. Except during winter, these are used only within the area of the station. There are no roadways. Two Zodiac inflatable craft are in use with five in reserve. There is no jetty and craft are operated directly off the shore. Although there is no possibility of fixed wing operations, helicopters to at least Sea King dimensions can operate onto the flat area between station buildings and shore, and a helipad will again be available after other building work ceases.

There have been no changes to communication facilities since the 1992 provision of information to SCALOP.

Arms and Explosives

None are held.

Environmental Protection

(i) Services and waste management

Two natural lakes within a few hundred metres supply water throughout the year. Instructions on waste management form part of the station's standing orders. Waste is separated into plastic, glass, cans and organic. Most waste is retrograded to Brazil where the final destination is not known. Combustible and organic material is incinerated in a two-stage hospital type incinerator operating at a temperature of 800–1,000 degrees; monitoring of emissions is visual. Sewage and grey-water passes through a septic tank system (currently being replaced) which is treated by the addition of 20 grammes of chloride per month. Effluent is discharged to the sea.

(ii) Emergency response capability

Personnel are trained in fire-fighting before leaving Brazil and exercises are held twice per month throughout the year. Fire-fighting equipment consists of extinguishers and a pressurised fire main but, although there is an alarm system, there are neither detectors nor sprinklers. A fire watch is maintained throughout the night and there is a detailed plan for both preventing and fighting fire and for evacuation of the accommodation block. The buildings are in good condition both inside and out, but exposure of electrical wiring, together with the use of unprotected electrical heaters in some locations gave the team cause for concern.

The station's complement includes a doctor who has a small but well equipped hospital with X-ray, operating table and light, dental chair etc and an electrocardiograph but no defibrillator. In an emergency arrangements would be made locally with Eduardo Frei Station (Chile).

(iii) Environmental Impact Assessment (EIA)

It was not known if EIAs have been prepared in the past nor if any were planned.

(iv) Conservation of flora and fauna/protected areas

Training for all staff includes environmental protection and waste management, and a copy of a visitors' guide to the Antarctic and a map of the local area, also used to brief tourists, is given to personnel. There are no alien species present. There are no protected areas near the station but there are moss banks and areas in which birds nest. These are drawn to the attention of staff.

Tourism/NGO Activity

About 650 tourists from six ship visits landed at the station this year. Chilean Navy ships often carry a few passengers and three yachts have visited. Only small groups of 30 or less are allowed ashore and each must be accompanied by a guide or guides to be stationed at specified points along the route used. Advance notification is requested. The Base Commander expressed the feeling that tourist visits tend to disrupt the station's operation

Conclusions

This is a station carrying out a considerable amount of scientific work. It is in good condition and is being well run. There was no sign of any oil spillage and a paving stone surface on which any such would be more obvious was being installed beneath the tank outlets. The area around the station was clean and tidy (a detailed search for any litter is carried out four times each year) although with re-supply pending, the foreshore was covered by many boxes and other material. The Inspection Team had some concern about the use of uncovered electrical fires in the accommodation building, since these appeared to present an unnecessary fire risk. A fire detection system would be a prudent addition to the facilities.

HENRYK ARCTOWSKI (POLAND): visited 9 February 1993

General

This year round station is located on a gravel beach berm 500 metres east of Point Thomas on the western shore of Admiralty Bay on King George Island at 62° 15' S, 58° 28' W. The station is operated by the Department of Antarctic Biology of the Polish Academy of Science. Scientific research is its primary aim.

Physical Description

The closest station is the Brazilian "Comandante Ferraz", at 10 kilometres across Admiralty Bay. The Peruvian summer station, Machu Picchu, is also at a similar distance. The station was opened on 26 February 1977. All buildings were constructed in the first few years. What was formerly the greenhouse is used now as emergency accommodation. The station supports three small field huts, each with some food and fuel, at distances of 2, 10 and 15 kilometres. A radio antenna hut is located on the top of Point Thomas. There are 17 buildings at the station, including storage sheds. None are recent and no more are planned. Their state is variable, most need external maintenance and repainting, though interiors, in particular for the living and working spaces, are well maintained and quite comfortable.

Personnel/Military Support

At the time of the Inspection the station complement was 14, all civilian, six being scientists and eight logistic support personnel. They were all at the station as field trips are usually of very short duration. The station is civilian-operated; there are no military personnel or military support. Normal length of tours is one year. The maximum comfortable capacity of the station is 20, with the possibility of accommodating five more if necessary. Scientists working at Arctowski either have doctorates or are working towards them.

Personnel bound for this station receive training in safety and environmental matters, survival techniques and fire-fighting. Information on the Antarctic Treaty system is also given. More specific training is provided on base. Preliminary medical, and sometimes psychological, screening of personnel is performed under the supervision of the expedition doctor.

Scientific Research

The main purpose of this station is scientific research. The marine biology programme is the most important line of research and there are two dedicated laboratories, reasonably well equipped, with limited computer facilities. The work of the station is related to that carried out within the framework of the international BIOMASS programme. The station also collects seismographic, three-component magnetometric and meterological data. These data are then transmitted to the relevant international networks.

Scientists at the station take part in a number of international programmes, eg, in the survey of coastal ecosystems. Foreign exchange scientists are sometimes guests at the station, mostly during summer months. Funding is available for the continuation of existing programmes at a reduced pace for the next two years.

Logistics/Equipment

Electricity is generated by three 90–kilowatt diesel generators (one in operation, two in reserve). Heating of the station is electric. The total annual fuel consumption is about 80 tonnes of diesel fuel. Neither cogeneration nor alternative energies are used. The exhaust of the diesel generators is filtered, and monitoring of mosses which grow in the area surrounding the generator shed has been performed in order to detect possible impact.

Water is obtained from two ponds, and a small stream near Point Thomas; it is used in the cooling of the diesel generator and, thus preheated, stored in the station. This reduces the risk of pipes freezing. There are few hazardous chemicals, mainly photochemicals for darkroom use and laboratory reagent. They are kept in their original containers and retrograded after use. An inventory of hazardous chemicals is not kept.

The storage capacity for diesel fuel is 1,000 tonnes in a large double-walled steel tank, located at Point Thomas, about 800 metres from the main station building and inspected at the time of fuel re-supply. There is no berm around the tank which at present contains about 200 tonnes of fuel. The tank is monitored by inspection of the space between the double walls at the time of fuel transfer. Fuel is transferred by electrical pump to a mobile tank for transport to the diesel generator shed in the station area.

Other fuel at this station includes twenty-five 205– litre drums of petrol, some drums of lubricating oil and a few drums of aviation fuel for helicopters. No bladder tanks are used. There are also ten 30–kilo bottles of LPG used for cooking.

Transport and Communication

The ground vehicles are two amphibians, two jeeps, one tractor, one Caterpillar bulldozer, and one motorised crane. There are about 2 kilometres of tracks between the station and the fuel tank, and the point where the "lighthouse" stands.

Small craft at this station include one inflatable with outboard, two large motor boats used to tow barges during the re-supply, and one motor sailer used for scientific work. There is no jetty, the crane and slipways on tracks being used to launch the various craft. There is a concrete helipad capable of operating a Sea King-size helicopter; no runway exists and no aircraft is based here. There is one helicopter flight per month from Eduardo Frei Station (Chile), carrying mail. Total average number of movements (including non-mail flights) is 20 per year.

Re-supply of the station takes place once a year by ship. During re-supply fuel is transferred using two 14–tonne barges from which the fuel is transferred to the storage tank through a flexible hose emptied by gravity at the end of the operation. In addition to the communication equipment listed in the SCALOP information exchange, a new INMARSAT system is being installed.

Firearms and Explosives

There are three .22 calibre rifles with some ammunition and a flare pistol.

Environmental Protection

(i) Services and waste management

There is no written Waste Management Plan, but instructions are given at briefings. Wastes are separated at origin. The station does not make use of radio-isotopes. Overall, wastes are dealt with in accordance with the Madrid Environmental Protocol. Food residues are burned in a metal vessel, and the ashes retrograded. A modern single-chamber high temperature incinerator has been purchased and will be installed shortly. A waste compactor is used and about 20 drums of solid wastes are retrograded to Poland annually. Sewage is treated in a septic tank and the effluent is discharged to the sea. This station has never made use of landfills or of disposal in ice pits.

(ii) Emergency response capability

The station has a surgery and a resident doctor. Assistance could be provided within a short distance of the station if weather conditions permitted and if transport were available. In case of Medevac, the station would contact the Chilean station at Eduardo Frei.

Neither smoke detectors nor sprinklers are installed and although personnel are trained in fire-fighting there are no regular fire drills. There is no formal oil spill contingency plan but personnel have been trained and dispersant is held, should a spill occur. There would be no possibility of providing assistance to others. No significant oil spills have occurred at this station in recent years.

(iii) Environmental Impact Assessment (EIA)

An "Assessment of the environmental impact of the H Arctowski Polish Antarctic Station" was published in 1991 in the journal *'Polish polar research'*. If there were in the future more activities at the station, an EIA would be performed. Environmental monitoring has been performed in the past on moss banks.

(iv) Conservation of flora and fauna/protected areas

SSSI No. 8 is about 200 metres away from the station though its boundaries are not marked. Base personnel are briefed on the rules relating to environmental protection, the conservation of wildlife and protected areas. Near the station there are penguin rookeries which are monitored. Entry into the SSSI is made regularly for scientific purposes.

Tourism/NGO Activities

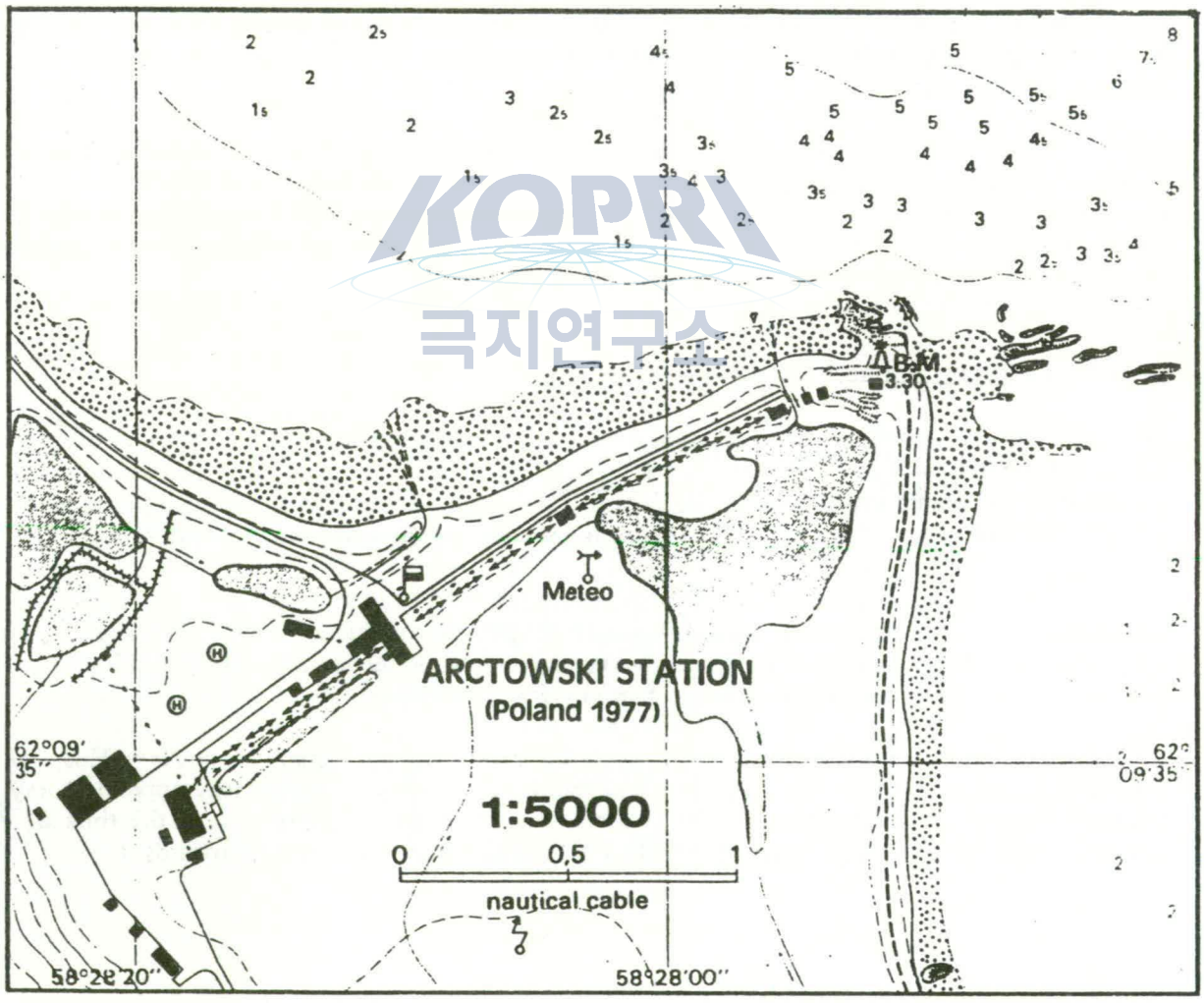
About 2,000 tourists were received in the current season. Arctowski receives on average 30 tourist ships per year. They are not seen as a great problem, provided advance warning of their visit is given.

Conclusions

This research station has produced in the past interesting results in the field of marine biology. It is well laid out, with widely spaced buildings to minimise the risk of fire. The level of maintenance is presently low due to financial constraints on the Polish Antarctic Programme, but the good state of maintenance of the living and working quarters and the recent acquisition of expensive equipment such as an INMARSAT system and incinerator are positive signs.

Much work will be needed to get rid of the large amount of discarded heavy equipment lying around the Point Thomas area. Also within the station area itself, a certain amount of tidying up is necessary. If no maintenance is performed reasonably soon, then some of the problems which at present are minor and of an "aesthetic" nature could degenerate into major ones.

ARCTOWSKI STATION LAYOUT



ARTURO PRAT (CHILE): visited 11 February 1993

General

Arturo Prat is a year round station located on the eastern shore of Discovery Bay, Greenwich Island, South Shetland Islands at 62° 28' S, 59° 40' W. It is owned and operated by the Chilean Navy with the aims of collecting meteorological and tidal data and supporting, when requested, ships and expeditions in the area. The Team was told that an agreement is being finalised among the Navy, the Instituto Antartico Chileno and the Catholic University of Chile with the object of launching a combined programme of Antarctic research at this station. A number of changes at the station may be generated by this programme, including new laboratories and new buildings. However, at the time of the Inspection, no firm plan was known to the station staff.

Physical Description

The station was opened in ~~1974~~ 1947, with the then main building still in use, other buildings having been added in 1984. There has been no other major construction since then. The station consists of one main building, one emergency building and four storage sheds, all in good condition. The station appears clean and tidy, with a dispersed layout on a 0.2 square kilometre site. The closest station is the Spanish Juan Carlos I at 37 kilometres.

At the time of the Inspection, considerable activity on major structural maintenance was in progress, including the total re-wiring of the electrical system which had caused fire problems in the recent past. There are no laboratories though apparently some may be added in the future for the new scientific programme. There is storage space for scientific samples and a PC to handle data from observations on meteorology, tides, glaciology and fauna.

Personnel/Military Support

The normal winter complement of the base is nine. At the time of the Inspection there were 52 on site, including 40 members of a working party for base maintenance and two scientists. The maximum comfortable capacity of the station is 15, all in single rooms. The large extra number of personnel at the station at the time of the Inspection were using the gymnasium as a dormitory.

The station complement is assembled one year before departure for Antarctica and attends 25 training courses in different subjects, ranging from general instruction such as fire-fighting, first aid, Antarctic culture, survival in ice and snow, environmental protection and risk prevention, to more detailed courses dealing with individual professions and specialisms.

Staff are screened medically and psychologically; Navy personnel in the Navy Hospital in Valparaiso; civilians at the Air Force medical facility in Santiago. Compulsory appendectomy is performed on all winter personnel. The two scientists present at Arturo Prat at the time of the Inspection had Antarctic experience; one had a PhD and the other was working towards it.

* correction advised by TPN from UK FCO 7/6/94

Scientific Research

Limited scientific research is undertaken at this station at present with data collection for tides, meteorology and some ice and biological observations. A marine biology research programme will begin next year though details of the programme, its size, funding and number of individuals and institutions taking part were not available.

Logistics/Equipment

Water is obtained from two wells. Up to 20,000 litres of drinking water can be stored in the station for use when the wells are frozen in winter; at such times brackish water can be used, if necessary, for washing and toilets.

Electricity is produced by three 40-kilowatt diesel generators, only one of which is run at a time. The total fuel consumption per year is of the order of 80 tonnes. The generator exhaust is filtered but not monitored. Diesel fuel is kept in eight 20,000 litre steel single-wall tanks, located in such a way that their delivery ends are under protective cover and adjacent to the generators. Total storage capacity for diesel fuel is 160 tonnes, part of which is available for bunkering if necessary. On station there are also 400 litres of petrol for outboards and one drum of aviation fuel. Ten 45-kilogram LPG bottles are used for cooking. There are no berms around the fuel tanks, but a concrete hardstand is planned and it may incorporate secondary containment protection.

The station is re-supplied once per year and for fuel transfer a length of 200 metres of flexible hose is used which is blown clean from the ship side at the end of the transfer operation. Mail and occasional small items are flown by helicopter from Eduardo Frei station.

Transport and Communication

There are no land vehicles at this station. Two inflatables with outboard engines are used and there is a small jetty which can operate small craft up to a length of about 10 metres. No aircraft operate from the station. There are three helipads for helicopters up to Sea King size, the number of movements being one per month from Eduardo Frei station (Chile) plus occasional other visits.

No new communication equipment has been installed recently.

Firearms and Explosives

No firearms or explosives are held at this station.

Environmental Protection

(i) Services and waste management

A Waste Management Plan is part of the standing orders of the Base Commander. All waste management actions are in line with the relevant Annex of the Madrid Protocol. In the last few years a programme of cleaning-up old wastes which have been accumulated at the station in its almost 45 years of activity has been implemented. The station looked very clean and tidy and very little waste was present. In the near future a backhoe is being brought to Arturo Prat and will be used in the excavation of old waste prior to its retrograding. Sewage is not treated, but discharged to the sea; a sewage treatment system will be installed shortly. There remains some controlled open burning.

(ii) Emergency response capability

Fire protection is based on the presence of extinguishers, breathing apparatus, fire hoses and an alarm system; a night fire watch is maintained.

There is a small surgery with a nurse. A Medevac would be organised with help from Eduardo Frei station. Some first aid help could be given in the vicinity of the station, depending on the availability of transport.

Oil spill preparedness is low at present, but this is about to change: Arturo Prat is planned to become a sub-centre of the Punta Arenas main oil pollution control centre. Among the oil-spill contingency equipment which will be delivered are 1,000 metres of floating containment boom, absorbent materials and dispersants. Station personnel have already been trained in oil spill control techniques and a group of advisers will visit the station when the equipment is delivered. The last significant oil spill occurred here in 1979, when an underground pipe carrying oil fractured and about 10,000 litres of diesel fuel were lost. All fuel piping is now above ground.

(iii) Environmental Impact Assessment (EIA)

No EIA has been prepared in the past; EIAs will be prepared for intended scientific activities.

(iv) Conservation of flora and fauna/protected areas

There are no protected areas in the vicinity of the station. Personnel are made aware of the rules relating to conservation of Antarctic wildlife; a handbook has been prepared and this has been distributed to personnel.

Tourism and NGO Activities

This station does not receive many tourists, the maximum being 400 a year. In the last few years, Arturo Prat has received on average 2–3 tourist ships per year. Visitors' guides are available.

Conclusions

Arturo Prat is one of the oldest continuously operating stations in Antarctica. Its buildings are of old-fashioned style and construction, but comfortable and well kept. The station site looks well managed and clean, even though when the Inspection took place, there were more than 40 extra personnel on site.

Virtually no scientific research is done at Arturo Prat. This will apparently change in the very near future with the final approval of the agreement among the Navy, INACh and the Catholic University. The policy of gradually retrograding old waste material is to be commended.

ESPERANZA (ARGENTINA): visited 14 February 1993

General

Esperanza is a year round station owned and operated by the Direccion Nacional de la Antartica, an agency of the Argentine Ministry of Defence, with Army personnel and the logistic support of the Navy.

Physical Description

The station is located at 63°40'S, 56°98'W on the rising shores of Hope Bay, which is a safe anchorage for large vessels. The nearest station is the Chilean Bernardo O'Higgins 40 kilometres away.

The station was opened in 1952 and a major expansion occurred in 1978 when families began to arrive. There are 16 buildings, the oldest dating from 1952. The main building has two storeys and contains the communal dining room, kitchen and stores; there are a number of smaller buildings for stores and workshops and a dozen bungalows, some of them housing families. Among these bungalows is a school building, a chapel and a surgery with a two-bed ward for which the equipment is adequate even if not particularly modern.

The buildings are generally well kept and freshly painted, though some older buildings need maintenance. They are in good order inside and are comfortably appointed. The latest additions are a new garage, three freezer rooms, a hut housing a seismograph and a tide gauge installation. There are no plans for further construction, but only for gradual improvements.

Esperanza maintains four refuges within a 40-kilometre radius.

Personnel/Military Support

The maximum comfortable capacity of the station is 45. At the time of the Inspection there were 70 on station, 22 military and 48 civilians, of whom 18 were family members. Around half of the military personnel provide logistic support, while the others were described as scientific. In summer the station complement is between 50 and 70, in winter 47. The tour of duty is 12 months for wintering personnel and three months for summer.

Personnel are trained in Argentina in the year prior to departure for Antarctica. There is general training and specific training for different specialities. The military are trained in Bariloche for cold weather survival techniques and the scientific and civilian personnel at the Instituto Antartico Argentino. Extra training for environmental protection is given on base.

Instruction on Antarctic Treaty matters is given on base and the relevant documents are available at the station. All personnel, both civilian and military, are medically and psychologically screened before final selection.

Scientific Research

Scientific research programmes are conducted in the following areas: meteorology and seismology (data collection); limnology, penguin biology, geology (not continuous), observational glaciology, oceanography (tidal); furthermore a programme of psychological studies is carried out on the families living here. The scientists use their own houses as laboratories. Scientists are generally young, some with PhDs, some with intermediate degrees. The station takes part in some international programmes in seismology, meteorology, biology and oceanography, and sometimes accommodates exchange foreign scientists: during the 1992/93 season there were Spanish and US scientists and an Italian scientist, who installed the seismograph, left on the day of the Inspection on the ARA *"Irizar"*.

Logistics/Equipment

Water is obtained from a natural lake. Electricity is produced by two diesel generators of 150 kilowatts each; only one generator is run at a time, the other is kept in reserve. A third generator of 96 kilowatts is kept on standby for emergency use. Generator exhaust gases are neither filtered nor monitored. No cogeneration or alternative energy sources are used, though the generator exhaust provides some pre-heating to an adjacent water tank. The total consumption of diesel fuel per year is about 220,000 litres. Also held on station are 6,000 litres of petrol and 2,000 litres of aviation fuel. One hundred and fourteen 45-kilogram bottles of LPG are held for cooking.

Diesel fuel is stored in 28 cylindrical steel double-walled tanks having a total capacity of 280,000 litres. These are located on a concrete hardstanding; there is no containment berm but no rigid piping is used. One tank at a time is connected to the generator tank using flexible hose. A bowser transfers fuel for heating to the individual buildings. Reserve fuel is held in a number of bladder tanks; a trailer with four 5,000-litre bladders is kept ready for possible emergency transfer of fuel.

Fuel is transferred from the ship by helicopter at the time of re-supply. The person responsible for fuel management is the station mechanical engineer and tanks are checked four times a day.

There are no hazardous chemicals apart from battery acid.

Transport and Communications

On station there are two Snowtracs, one Snowcat, four Muskegs, two Unimog trucks and seven skidoos. About two kilometres of crushed rock tracks run within the station area.

There are three inflatables without engines; the lack of outboards was explained as a safety measure to avoid people going too far from the base and being endangered by sudden winds. A small aluminium alloy boat with outboard, owned by one of the base personnel, was also present. There is a wooden jetty capable of handling small craft.

No aircraft are based on station. There is a helipad for helicopters up to CH-47 size. It is possible to land Twin Otters on the glacier behind the station; there is one such flight a month from Marambio.

The main re-supply of the base is in December by ARA *"Irizar"*.

There are no new communication facilities not covered in the 1992 SCALOP exchange of information.

Firearms and Explosives

None are held at this station.

Environmental Protection

(i) Services and waste management

There is a written plan for waste management and instruction papers are issued to personnel. The provisions of the Environmental Protocol are clearly adhered to. Wastes are separated at source with most, including ash from the incinerator, retrograded to Argentina. Sewage is simply macerated and then discharged into the sea. Washing waters are used to flush the toilets.

A programme of retrograding old wastes dumped in landfill is being implemented.

(ii) Emergency response capability

In case of medical emergency the station would contact Marambio. The station has an emergency patrol with a Snowcat equipped as an ambulance and trained personnel. Some emergency help could be given in the vicinity of the station, subject to the availability of transportation. The base at present does not have oil spill contingency equipment.

Fire protection is provided by extinguishers of various types though there are no sprinklers or smoke/heat detectors. A mobile water tank with 200 metres of flexible hose is dedicated to fire-fighting. Personnel receive training in fire-fighting and exercises are held every two months. There is a detailed written fire-fighting plan.

(iii) Environmental impact assessment (EIA)

No EIA was prepared for this station or for any activity going on there at present. In the case of new future activities, any EIA would probably be prepared by DNA. Personnel are instructed in conservation and environmental protection matters, both in their training in Argentina and on base.

(iv) Conservation of flora and fauna/protected areas

During training in Argentina and in standing orders, base personnel are made aware of the rules relating to the conservation of Antarctic wildlife and protected areas. Such standing orders were, however, not made available to the Inspection Team. There had been no significant impact on plants and animals in the vicinity of the base, nor had any native mammals or birds been killed or molested. The SSSI No 31 (Mount Flora) is within one kilometre of the station whilst Historic Monument No 39 is within the station. This has been restored but the interior still contains relatively recent rubbish. Scientists conduct monitoring of the protected areas as part of their programme, and apparently Base personnel had recently entered protected areas without permits.

The last of Argentina's sledge dogs left Esperanza on the ARA *"Irizar"* on the day of the Inspection.

Tourism and NGO Activities

About 500 tourists visited Esperanza in 1991/92, and the average number of tour ships per year is seven to eight. Although no specific procedures have been developed to deal with tourists, each tour group is given guidance and briefing, in line with SCAR guidelines, when they arrive. Tourists to date have caused no particular problems or environmental impacts.

No yachts or aircraft visit the station.

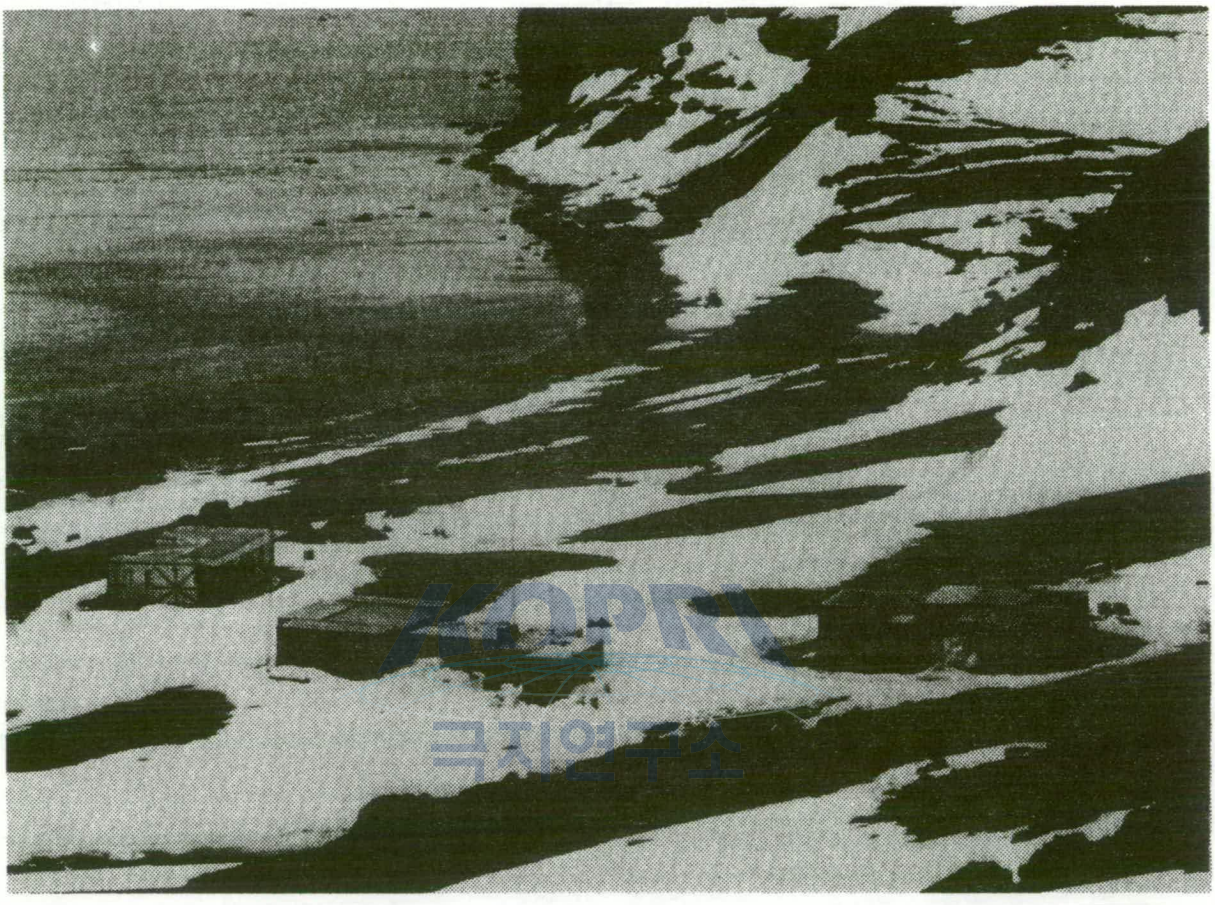
Conclusions

This is a well kept and well run station. The site is clean and tidy with no traces of any major oil spills.

There are no purpose–built laboratories and the scope of scientific research at this station is limited to limnology and penguin biology, together with the collection of ambient data.

Since 1991/92 the number of families on the station has increased slightly.

JUAN CARLOS PRIMERO (SPAIN): visited 13 January 1993



General

Juan Carlos Primero station is situated on the northern shore of the Hurd Peninsula, Livingstone Island, at position 62° 34' S, 60° 23' W. The station exists for scientific research and is occupied only for periods during the summer when for much of the time the research and re-supply vessel *"Hesperides"* is in the area. The station is operated by the Comision Interministerial de Ciencia y Technologia.

Physical Description

The station lies about 100 metres from and 15 metres above the shoreline of a small cove in South Bay. The nearest permanently occupied station is Arturo Prat, about 40 kilometres away on Greenwich Island.

During the 1987/88 season, one container laboratory, three storage containers and one-third of the present accommodation block was established. Additions were made in subsequent seasons which extended the accommodation block, enlarged the laboratory block approximately five-fold and doubled the amount of space in the storage block, which also houses the generators. The appearance is now of three well separated independent buildings which have a total floor area of 308 square metres. Individual buildings have been constructed from prefabricated units of shipping container dimensions. The fifteen individual units were dragged to their present sites on skids. The last construction carried out was of an eight square metre store for skidoos at the edge of the glacier, 150 metres higher and about one kilometre away. There are no plans for further expansion, only for internal improvements. The total area covered by the station, including fuel storage, is about 20,000 square metres. As would be expected of recent constructions, the buildings are in good condition both internally and externally. The station area was neat and tidy.

Personnel/Military Support

Six staff were present at the time of the Inspection, although when *"Hesperides"* arrived shortly afterwards, the number would increase to twelve, which is the average number on the station. Three of the personnel are support staff, the remainder scientific. There is no military support. The station can accommodate a maximum of fifteen. The normal length of stay is about 3.5 months. All support staff had multiple responsibilities although their posts were nominally cook, communications technician and mechanic. Staff do not attend any formal training courses before arrival, but are given comprehensive briefings and instruction on site; scientific staff are provided in advance with comprehensive briefing notes on the use of packaging and other matters. Pre-tour medical screening is undertaken.

Scientific Research

Programmes, some of which are carried out from or with the assistance of *"Hesperides"*, include geology, geomorphology (both of Livingstone Island and the South Shetlands), seismology and volcanology on Deception Island, lichenology, penguin reproduction (Deception Island), marine primary production (ship based), ozone sondes, marine hydrodynamics (using current meters and wave buoys in the Bransfield Strait and South Bay and tide gauges). Appropriate equipment is installed as required including that for an automatic weather station. The scientists include graduates, who usually work with more senior staff, and a number with considerably greater experience. *"Hesperides"* carries a number of technicians. Collaborative work is carried out with Germany on lichenology and Argentina on seismology. Two Swedish scientists worked on the station last season and two Germans were expected shortly. There have also been exchanges of scientists with France and the USA.

No radio-isotopes are used.

Logistics

Re-supply is by two visits each season from the ship *"Hesperides"*.

Diesel is stored in four bladder tanks (3 x 5,000 litres and 1 x 2,500 litres) located about 150 metres from the station buildings. A further tank is used as a spare. Annual fuel consumption is about 12,000 litres; about 17,000 litres were held at the time of the Inspection. Protection against damage from drifting snow is provided during winter for those tanks containing fuel. The tanks are on a sandy area and rest on a membrane. Bulk fuel is in 60 metre lengths, with automatic cut-off

valves on decoupling. After use each section is drained by gravity into 200 litre drums, the area round the drum being surrounded by absorbent. Fuel is transferred from the bladders to short-term storage tanks outside the generator building through a narrow bore hose buried shallowly in the sandy soil. From the state of the ground beside the storage tanks, it appears that limited amounts of fuel have escaped during this operation. The mechanic and communications technician are responsible for fuel management, and a daily manual check of the fuel is made. Three 300 litre drums of petrol are held for use in skidoos and Zodiacs. A 250 litre plastic tank is installed in the skidoo store. Thirty bottles of propane are used for cooking and water heating. All fuel held is for use on the station. It is intended that an oil spill contingency plan will be prepared shortly. At present 100 metres of absorbent boom and matting is held on the station to deal with spills.

Electrical power is supplied by a 30 kVA air cooled diesel generator with another on standby; exhaust emissions are neither filtered nor monitored. An experimental system installed this season of two 500 watt horizontal axis wind generators charges a bank of large batteries which supply energy for the scientific area. A solar panel provides power for an experiment on lichen. Space heating is provided by hot air from small burner units while cooking and water heating uses Propane.

There are few hazardous chemicals on the station. A few litres of acetone are stored in the laboratories and some formalin in a separate store. There is no formal monitoring or inventory.

Transport and Communication

No roads have been constructed but a track has developed between the station and the landing beach about 300 metres away. This is used during relief by the one small tracked tractor with tracked trailer held on the station, and at other times to move inflatables and equipment to the shore. Two skidoos are used on the ice-cap. There are two four-metre Zodiac inflatables, one being held in reserve, together with a 4.5 metre rigid GRP boat; 25–30 HP outboard motors are used. Flat areas exist within the bounds of the station on which a helicopter can be landed. At present a helipad is not marked and aircraft should beware of landing to the west of the buildings where a lichen study area exists.

Since the provision in 1992 of information to SCALOP, an INMARSAT telephone has been installed.

Firearms/Explosives

Neither explosives nor firearms are held.

Environmental Protection

(i) Services and waste management

Water is obtained from a stream of glacial meltwater via flexible hose and a settling tank. At the beginning of the season when this source is not available, a small glacial lake about 300 metres away which never freezes throughout its depth is used.

There is no formal Waste Management Plan but information is contained in a number of documents. Staff are briefed on procedures both before and after arrival on station, and notices are displayed. Waste is segregated at source, cartridges for Polaroids and lighters being collected with batteries. A double stage incinerator operating at about 1,000 degrees is used; its emissions are not monitored but appeared to be only clear gases. A compactor is in use. All categories of waste are dealt with in accordance with the Protocol. Open burning is not permitted. Non-combustible material is retrograted to Punta Arenas where it is put into the charge of the ship's agent. Sewage passes through three septic tanks followed by a further three-stage chamber in which the effluent is subject to biological and chemical treatment prior to discharge 80 metres offshore.

(ii) Emergency response capability

There is no doctor on the station nor a surgery but pharmaceutical supplies are held. There are two doctors on *"Hesperides"* from whom advice and assistance can be obtained. In view of this, no formal plan exists for dealing with a medical emergency.

Fire-fighting equipment consists of extinguishers and a mobile fire pump for which permanent installation is planned. The water supply for fire-fighting would be the small stream which flows past the station. Training in dealing with a fire is given by experienced support personnel when staff arrive on the station.

(iii) Environmental Impact Assessment (EIA)

An EIA was made and forwarded to COMNAP for the most recent construction, the eight square-metre store.

(iv) Conservation of flora and fauna/protected areas

The need for protection of the environment and conservation of flora and fauna is stressed to all staff using various documents as well as verbal briefings. There was a very clear commitment to these matters. Impact is monitored by lichen studies and annual surveys of benthos.

Parsley is grown on the station in imported compost and a few houseplants were landed from *"Hesperides"* but are not thriving. Although there are no protected areas within 15 kilometres of the station, there are extensive moss banks near the shore and personnel are instructed not to walk on these.

Tourism/NGO Activity

Visits from tourist ships are discouraged and there has only been one since the station opened in 1987/88. This took place earlier this season when sixty tourists from *"Vavilov"* were allowed to land but not to visit the base.

Conclusions

This small summer-only station conducts a range of scientific work in a compact, simple facility with the minimum of staff needed to operate it. There is clear commitment to environmental protection and the conservation of flora and fauna. The station is laid out in such a way as to eliminate risk of total destruction by fire; nevertheless, provision of a fire detection system might be considered. Some improvements could be made to the arrangements for the storage and transfer of fuel inside the station, even though the consumption of fuel by the station is small. Overall the Team formed a very positive view of the operation.

FOSSIL BLUFF (UNITED KINGDOM): visited 30 January 1993

General

Fossil Bluff is a small (summer-only) station of the British Antarctic Survey used by aircraft supporting field parties on Alexander Island and on the Peninsula. It is located on the Western side of the George VI Sound at 72° 30' S, 68° 17' W. It operates as an outstation of Rothera from which access is by air; being an outstation, procedures and practices are in general as for Rothera.

Physical Description

The station is one kilometre from the aircraft ski-way on the rising rocky slope of the west side of the Sound. It consists of:

- a main accommodation hut with four berths, a cooking space, a washing facility, some working and storage space; the accommodation is spartan, but not uncomfortable;
- a smaller hut with a small workshop for skidoos and mechanical equipment repairs;
- a smaller diesel generator shed with its fuel tank;
- an emergency refuge in a sled-mounted container with two berths and a small stock of food;
- a small meteorological hut with a thermograph, a barograph and an anemograph;
- a nearby ski-way with a fuel dump of about 200 drums (205 litres) of aviation fuel.

The small buildings are in reasonably good condition. They are sufficiently distant from each other to be isolated in case of fire. Fossil Bluff is a very small station and except for the area to the north of the huts looks neat.

Personnel/Military Support

The station usually has only two "resident" personnel. These switch over every few weeks.

Environmental Impact Assessment

Water supply is from glacial melt-water. Wastes have been dumped on the north side of the huts for most of the lifetime of the station. In the recent past snow and ice melt, due to higher average temperatures, has gradually uncovered these old wastes. Work is proceeding to return this waste to Rothera Station from where it will be retrograded. Biodegradable waste (sewage, greywater) will continue to be dumped into an ice-crack. The fuel drums are continually re-supplied from Rothera Station, with a maximum turnover time of 12 months.

Transport and Communications

The station has a radio and two skidoos. It has food and fuel reserves capable of sustaining it for a few months in case of bad weather, with consequent temporary isolation.

Conclusions

The overall impression of this station was positive, though efforts should continue to clean-up and remove former waste material.

GABRIEL DE CASTILLA (SPAIN): visited 7 February 1993

General

This station was visited on 7 February 1993. A full Inspection was not carried out, the station being regarded as complementary to Juan Carlos Primero. Nevertheless, the subject areas dealt with by the Inspection Checklists were borne in mind during the visit.

Physical Description

The station lies on the southern side of Fumarole Bay, Port Foster, Deception Island at position 62° 58'S, 60° 40' W. It was built during the 1989/90 season (but not used during the 1991/92 season) to support scientific projects which have been funded for limited durations. The station is sited on a slightly sloping area of volcanic ash about three metres above and 30 metres from the shoreline. The ground is devoid of vegetation and there are no colonies of animals or birds in the area.

Personnel/Military Support

The station is occupied only between late November and late February. It normally has a complement of 12 but at the time of the visit 14 (Base Commander, engineer, radio technician/operator, three biologists, four cartographers, and four geomorphologists/ geologists) were living on the station (and three seismologists were staying at the Argentine base about a mile further along the coast to the west). Most scientific personnel are civilian, some being from the Spanish Army.

Scientific Research

Scientific work being carried out is

(a) cartographic surveying to produce a map of the island at a scale of 1:25,000,

(b) penguin biology,

(c) geomorphology and

(d) volcanology.

Logistics

The station occupies an area of less than 2,500 square metres with bladder tanks used to collect and store water being located about 50 yards away from the buildings. These are prefabricated sectional Army field huts, which require no permanent foundations. The main living block is about seven metres by nine metres and houses a bunkroom with 14 beds, a dining/working room, a large office with tables and desks, a small kitchen and a flushing toilet. The toilet feeds into a three-chamber septic tank. This hut is heated by a large, thermostatically controlled warm air blower fuelled by diesel. A small hut houses two generators, one of 10 kilowatts and the other of 25 kilowatts; the larger is used in the morning and evening, the smaller during the middle of the day and power is switched off at night. About 100 litres of fuel is used each day.

Fuel (20 drums of 205 litres of diesel, and six drums of 205 litres of petrol) is stored in drums and only two of these are left on site during the winter. Two John Deere all terrain vehicles are used to move cargo from the landing beach and around base. Two inflatable craft are used to off-load cargo from the *MV "Hesperides"* and for local transport. There is a storage hut about four metres by nine metres, one end of which is occupied by a small workshop. Three tents each about three metres by two metres provide further storage space.

Environmental Protection

Combustible waste is burned in a simple incinerator. The ash from this and other non-combustible waste is loaded into used 205–litre drums and removed to Punta Arenas or Spain along with the waste from Juan Carlos Primero. The station was neat and tidy with no evidence of oil spills, and it was clear that the station personnel were as aware of environmental protection as the staff at JCP. Water for the station was being collected from the natural melt of a bank of snow in a nearby gully, although earlier in the season it had been possible to use a natural melt stream flowing through the same gully.

Conclusions

This small summer-only station with minimal but comfortable facilities appeared to be undertaking a sound programme of scientific and scientific support work.

DECEPCION (ARGENTINA): visited 8 February 1993

General

The station lies on the southern shore of Fumarole Bay towards the north-west of Port Foster at position 62° 58' S, 60° 41' W. Prior to the volcanic eruptions in 1967, the station had been occupied year round. In recent years, the station has been occupied each summer from about the end of November until the end of February by a team of Argentine personnel (normally five geologists and geophysicists, together with four Navy support staff) but these had been withdrawn on 7 February (the day before the Inspection) by helicopter from the *ARA "Almirante Irizar"*. Three Spanish seismologists were occupying the buildings for a further few weeks.

Physical Description

The station is about two kilometres from the Spanish base, Gabriel de Castilla. It occupies a relatively flat area of cinder-covered ground a few feet above sea level and within 100 metres of the shoreline. Behind the station the ground rises steeply. There are two large fuel tanks at the base of the rising ground, both of which are believed to be empty. As well as a number of small huts, two main buildings remain. The first is rectangular, about 10 x 30 metres, with a pitched roof covered in corrugated iron. Its eastern end, through which entry is gained, is an open space now used for general storage including drums of fuel, lubricants, some mechanical spares and building materials. The remainder of the building provides accommodation. Very little if any maintenance work, other than some basic electrical wiring, appears to have been done in recent years, but the building offers wind and weatherproof shelter, and has a small kitchen together with washing facilities. Water is obtained from a borehole using a pump powered by a small portable generator which also provides power for some time each day. The second large building consists of a number of interconnected wings. It is in a state of disrepair with considerable water penetration through its damaged roof, and has apparently been stripped of furnishings etc at some stage. In a basement room is a concrete plinth on which Spanish scientists have mounted seismic recording heads connected by cable to recording instruments in the other hut.

Environmental Protection

About 30 metres to the south-west is an area containing about 100 rusting 200–litre drums (some of which appear to contain oil), a considerable quantity of rusting steel culvert, and other waste metal. There are also two shallow depressions in which the remains of food cans, bottles and other wastes can be seen. In a small hut to the south are two barrels containing liquid, one of which is oil of some type, which is now seeping through the corroded barrel. No other hazardous materials were discovered except in a small hut, the closest of all to the shore, which appears still to be used to store lifejackets etc for boating operations. In this hut there were still a number of cans of paints and other inflammables. Many were corroded. Around and between the huts were the remains of aerials and poles which had carried power or telephone lines. While some masts now lie on the ground, others are still standing and represent a danger to humans and wildlife due to their corroded state.

The site presents some characteristics of an abandoned base rather than a summer-only station and it is recommended that efforts are made to clean-up this station, including removing waste materials from the site.

DECEPTION (UNITED KINGDOM): visited 13 February 1993

General

The abandoned British base on Deception Island lies on the northern shore of Whaler's Bay in the south-east corner of Port Foster, close to the entrance through Neptune's Bellows, at 62° 59' S, 60° 34' W. The station was abandoned following volcanic eruptions in 1969 during which most of the buildings were badly damaged by a flow of ash carried in meltwater.

Physical Description

The group of buildings which remain consist of the former living quarters and adjacent generator shed about 100 yards from the shoreline, a storage shed about half way between this and the shore and a hangar some 200 yards to the north-west. About a hundred yards to the south-east and close to the remains of an earlier Norwegian whaling station is a hut built by the Falkland Islands Dependencies Aeriel Survey Expedition (FIDASE) in 1955.

With the exception of the hangar, all the buildings are in poor condition. Most window glass is missing and ash has flowed into the structures, in the case of the living hut, removing a large section in the middle of the building and one corner. Although there are no hazardous materials or fuels remaining on site, the interiors of the building are generally untidy with litter, including old cans and doors which have been wrenched off their hinges. Around the buildings there are also quantities of broken timber and other building materials. Some of this has been collected into stacks presumably by the clean-up team which visited the site during the 1991/92 season. In the hangar are more stacks of larger material and aircraft parts awaiting removal.

Environmental Protection

The remains of this former base do not seem to pose any danger to wildlife, but in the living hut, stairs still lead to a floored area in its roof space. As the structure below has been partially destroyed it would seem sensible to deter entry by removal of the stairs. It was noticeable that there was a collection of relatively recent cans and bottles in this upper area (and two empty food boxes in the lower part of the building). The building may have been used as a shelter by staff working at the old Argentine base during summer seasons. The site is certainly visited by many tourists every year and signs warning of possible danger from the collapse of structures would seem appropriate. This also applies to the remains of the whaling station where all of the steel structures, including some ladders, are heavily corroded and liable to collapse especially if climbed upon.

MS "EXPLORER" (LIBERIA)

General

The tourist ship *MS "Explorer"* was inspected on 13 January 1993. This was done with the prior approval of her Master (a German national) while she lay at anchor in Arthur Harbour, Anvers Island, and discharged her passengers to visit Palmer Station.

The *"Explorer"* is registered in Monrovia, her managing owners are Explorer Shipping and she was being used by tour operators Abercrombie and Kent who are members of IAATO. The vessel was built in 1969 for use in polar waters and is of 2,353 gross tonnes with ice classification + 1A1 ICE A. It has a bow thruster and is well equipped with a wide range of modern equipment including GPS, satellite navigator, one 10 centimetre and two three centimetre radars, and two independent echo sounders.

The crew of 61 is well qualified and the four most senior deck officers have prior Antarctic experience as do approximately 50% of the ratings; in addition, most officers have Arctic experience. All of the cruise staff, numbering ten, have prior Antarctic experience. The vessel makes eight or nine cruises into Antarctic waters between early November and the end of February. A maximum of 94 passengers can be carried, there being 64 on board at the time of the Inspection.

During the 1992/93 season, arrangements had been made for a total of 11 visits to the following stations:- Arktowski, Faraday, Ferraz, `Palmer and Signy.

Waste Management and Disposal

The vessel operates in accord with MARPOL and IMO regulations and during Antarctic operations no waste is dumped, there being capacity on board sufficient to store waste from eight days' operations. However, waste stored on the after-deck was poorly secured against heavy weather. A shredder and a compactor are used but food waste is not comminuted. Plastic and batteries are retrograded to Punta Arenas where they are discharged into the care of agents. A two-stage incinerator operating at between 850 and 1,000 degrees Centigrade was in use. Oily water is passed through a separator, oily residues being discharged at Punta Arenas. Although the ship's staff were not aware of the Environmental Protocol to the Antarctic Treaty, they were certain that if this was ratified by the USA, the tour operators would insist on full compliance. Instruction on waste management was given to both crew and passengers and notices were displayed on board.

Prevention of Oil Pollution

Marine gas oil, 285 cubic metres, is carried in double-bottomed tanks. An oil spill contingency plan is in preparation but at present no booms or equipment to deal with spills is carried. The vessel is flagged in a MARPOL State and is aware of the special IMO Antarctic provisions.

Emergency Response Plan and Ship Safety

There is no formal emergency response plan nor specific backup, but the vessel has the necessary information to allow contact to be made with all tour vessels and stations in the area, in which she has operated for many years. The vessel has a small surgery and carries a doctor; passengers are required to provide certification that their own doctor considers them fit for the cruise. Although the average age of the passengers was 68, the tour director commented that they were very aware of and realistic about their own capabilities.

The vessel is well founded for operations in Antarctic waters and carries a range of up-to-date charts. The Master, in particular, and senior deck officers, all have Antarctic experience and most also have sailed in the Arctic. About 50% of the crew have also had prior Antarctic experience.

Although the Inspection Team had no concern about the safety of the vessel, shortly after entering Arthur Harbour it was observed that the vessel's chart showed no track after the initial line of approach. There were no clearing bearings marked on the chart nor a safety swinging circle based on the anchor position. No doubt the highly experienced and competent bridge team have their own natural transit data for each anchorage and approach. Nevertheless, should a grounding occur, the lack of formal navigational planning data could be an embarrassment.

The vessel's open lifeboats are not ideal for survival in Antarctic waters, but survival suits are carried for the crew with hypothermia bags for the passengers. The crew are briefed on the factors and dangers affecting survival in cold conditions.

Conservation Policy

No EIA had been drawn up in relation to the vessel's operation, but the Master believes that there is no significant environmental impact. Treaty documentation is carried on the vessel but although both tour and ship's staff were fully aware of protected areas on land, it was not clear that this applied to the same extent in respect of marine areas.

It became clear to the Inspection Team that the attitude of both marine and tour personnel was highly positive in relation to conservation of the Antarctic environment. The Master stated that the tour operators, who are members of IAATO, were the first to introduce guidelines for tourist behaviour. Tour brochures include the IAATO guidelines and education continues from the time of booking, considerable effort being devoted to ensuring that passengers are fully aware of, and comply with, the measures of the Antarctic Treaty and relevant US legislation. Operations are conducted in compliance with that legislation.

For shore visits there are always less than 20 passengers per guide, and for sensitive or small sites, the passengers are split into groups. Impact on such sites is reduced by consultation with other ships' Masters and tour operators to avoid itinerary clashes so that sites are not over-visited.

Conclusions

This small vessel is well suited to operating in the Antarctic and has done so under a number of owners/operators for many years. The attitudes of those currently operating the vessel demonstrate a commitment to the Antarctic Treaty and its Measures and this also appeared to be true of the passengers.

MS "EXPLORER" – Technical Specifications

Port of registry	Monrovia, Liberia
Managing owners	Explorer Shipping
Vessel built	1969
Tonnage	2,353 gross; ice classification +1A1 ICEA
Subsidiary propulsion	Bow thruster
Navigational equipment	Wide range of modern equipment including GPS, 3cm and 10cm radars, satellite navigator and two independent echo sounders.
Environmental equipment	Two stage incinerator 850–1,000°C. Separator used for oily water

MS "AKADEMIK SERGEY VAVILOV" (RUSSIA)

General

The *MS "Akademik Sergey Vavilov"* was inspected on 4 February 1993, while she was at anchor in Whalers Bay, Deception Island and landing passengers. This was done with the approval of her Master, a Russian national.

The MS *"Akademik Sergey Vavilov"* is registered in Kaliningrad and is owned and operated by the Russian Academy of Sciences. She was on charter jointly to Quark Expeditions (USA) and Polar Schiffahrt (Germany). The vessel was built in 1988, is ice strengthened to Russian Class A1 (Lloyds 100A) and is of 6,600 gross tonnes. She is fitted with bow and stern thrusters and is very well equipped with a wide range of modern navigational and other equipment. Designed as an oceanographic research vessel, for which role she is excellently suited, her up-to-date accommodation has facilitated her adaption to carriage of passengers.

Her crew of 44 are from the former Soviet Union. Although this is the first season during which the vessel has worked in the Antarctic, the senior officers have all made two or three trips to the area with the Russian Institute of Oceanology. The three tour guides all have prior Antarctic experience. During the season the vessel will make five cruises to the Antarctic Peninsula area (and one to South Georgia). Of the 95 available passenger berths, 75 were occupied.

One or two stations are visited on each cruise.

Waste Management and Disposal

The ship's officers were aware of the provisions of MARPOL and although there did not seem to be full appreciation of the special IMO provisions for Antarctica, the vessel was acting in accord with these; there was however a lack of awareness of the Environmental Protocol to the Antarctic Treaty. The Plan for Waste Management was provided by the tour operator and is essentially to remove all waste from the Treaty Area but there is no document setting out all the measures being taken.

A compactor is used and, after storage while in Antarctic waters, most waste is discharged in Ushuaia for local dumping. Empty glass bottles are stored and then sold in Germany. A single stage incinerator with an operating temperature of about 1,000 degrees Centigrade was under repair at the time of the Inspection. Oily water is passed through a separator, residues being discharged in Germany. Notices about waste management are displayed on board and instructions given to both crew and passengers.

Prevention of Oil Pollution

The vessel has a bunkering capacity of 1,050 tonnes in double-bottomed tanks and was carrying 280 tonnes of marine gas oil. An oil spill contingency plan was prepared at the time of the vessel's construction; no booms or other equipment to deal with a spill are carried.

Emergency Response Plan and Ship Safety

No emergency response plan is known to exist but the vessel can contact stations and other vessels in the area. There is a very well equipped and reasonably sized hospital on board, with facilities which include an operating table and light and an X-ray machine (although a comment was made that they did not have the chemicals to develop plates). The vessel carries a doctor (a qualified surgeon at the time of inspection) and all passengers are required to be screened by their own doctor and make their medical records available.

The vessel is well suited to operations in Antarctic waters and was manned by competent, experienced personnel. Navigational and communications equipment was excellent, modern and wide ranging. Bridge procedures were good. However, most notices on board were prominent in Russian but repeated only rather small scale in English; this could present a problem in that none of the passengers (from several nations) were Russian.

The vessel has enclosed lifeboats and appropriate associated equipment.

Conservation Policy

No EIA has been carried out in relation to the vessel's activities. Treaty documentation, including an up-to-date list of protected areas, is carried. Regulations are conveyed to passengers by means of lectures and use of notice boards; the tour operators being members of IAATO, their guidelines are used, but use is also made of those drawn up by Greenpeace and Infuetour and note is taken of both US legislation and NZ tourist policy. Specific tour documentation appeared to be lacking but information on conservation policy was being effectively transmitted to passengers and crew. The latter were specially briefed in relation to alien species and gangway checks ensure that nothing is taken ashore nor souvenirs brought on board.

Given the numbers of cruises to date, with three tour guides, groups of visitors on shore have always numbered less than 20 per guide. On each cruise 12 or 13 landings take place, including one or two to major stations. Impact is minimised by thorough briefing and policing by tour guides who are all naturalists. Consultation takes place with other tourist vessels to avoid simultaneous landings. The stations visited appear to be limited to those willing to accept landings at short notice and no problems had been identified during such visits.

Conclusions

This very capable vessel, designed to carry out oceanographic research in polar waters, is crewed by competent mariners, a number of whom have Antarctic experience, and is thus suited for conveying visitors on tours in Antarctic waters. The tour operators ensure that the operation of the vessel and activities involving the passengers are carried out with due regard for the Antarctic environment and it was noted that the general attitude of passengers was very supportive of this approach.

MS "AKADEMIK SERGEY VAVILOV" – Technical Specifications

Port of registry	Kaliningrad, Russia
Managing owners	Russian Academy of Sciences
Vessel built	1988
Tonnage	6,600 gross. Ice-strengthened to Lloyds class 100A
Subsidiary propulsion	Bow and stern thrusters
Medical facilities	Well-equipped hospital on board
Navigational equipment	Wide range of modern equipment
Fuel capacity	Total 1,050 tonnes
Environmental equipment	Compactor; separator used for oily water; single stage incinerator

MS "EUROPA" (GERMANY)

General

The cruise liner *MS "Europa"* was inspected on 6 February. This was done with prior consent of her Master, (a German national) when she lay at anchor at the entrance to Deception Island and began to disembark passengers for shore visits.

The *"Europa"* is registered in Bremen, Germany and her managing owners are Hapag-Lloyd. Neither the vessel owners nor the tour company are affiliated to IAATO. The vessel was built in 1981, and is of 37,012 gross tonnage. It is well equipped with a wide range of modern equipment including GPS, 3 cm and 10 cm radars, ARPA, LORAN and DECCA.

Although the crew of 294 is well qualified and experienced in temperate water conditions, and have visited the Arctic, this was the first time the vessel had entered Antarctic waters. The crew was in consequence not experienced in Antarctic conditions.

The vessels was carrying 530 passengers (out of a maximum capacity of 730). Arrangements had been made for possible visits to Esperanza and Arctowski stations but weather prevented these visits being accomplished.

Waste Management and Disposal

There was awareness of MARPOL but not, it seemed, of the Environmental Protocol to the Antarctic Treaty though a copy was on board the *"Europa"*. The vessel had a single incinerator with an operating temperature of 800 to 1,000 degrees C. Oily water was passed through a separator. The vessel had sizeable slop tanks and the capacity to store sewage and greywater for ten days.

Prevention of Oil Pollution

Heavy fuel oil, 1,238 tonnes, and marine diesel, 329 tonnes, was being carried. Total bunker capacity was 2,6000 tonnes. Fuel tanks were double-bottomed. In respect of oil pollution and environmental matters, the vessel regularly enters US waters and meets all US requirements; relevant certificates were on display in the bridge in relation to this.

Emergency Response and Ship Safety

No emergency response plan, tailored to Antarctic conditions, was known to exist. With "Europa" spending only three days in Antarctic waters, it seemed to the Inspection Team that there was a lack of awareness of the unique problems presented by Antarctic conditions. Several aspects of the vessel's equipment, configuration and over-reliance on the accuracy of navigation charts gave cause for concern. The sheer numbers of personnel on board the vessel, coupled with the average age of the passengers, would have presented any SAR agencies with an almost impossible task. Should a serious emergency occur with a vessel of this configuration, neither the ship itself nor external SAR agencies would be in a position to effect timely life-saving or MARPOL control.

After discussion with the Captain, Staff Captain and key officers, followed by a brief tour of the ship, the following was observed:-

(a) the vessel is classified to German Lloyd *100 A4 E1, though not specially ice-strengthened for Antarctic conditions;

(b) the twin propeller and rudder configuration is exposed to potential strike from sub-surface ice or growlers;

(c) there is no radar mounted at low level in the bow to detect low-lying growlers;

(d) the crew is not experienced in operating in Antarctic conditions;

(e) although the vessel carried up to date Chilean, Argentine, UK and Polish charts, there appeared to be an over-reliance on their accuracy. Adequate surveying is invariably incomplete in Antarctica with chart coverage taken from old surveys. For example, it was noted with concern that *"Europa"* had circumnavigated Rosamel Island (South Antarctic Sound) in an area of incomplete survey with known, and uncharted, rock pinnacles;

(f) the lifeboats are not ideal for survival in Antarctic waters (covered-in or partially enclosed lifeboats had capacity for only 50 per cent of the ship's personnel/passengers).

Conservation Policy

Some specific points concerning environmental protection under the Antarctic Treaty system made by Hapag-Lloyd were known by the marine staff, but there was relatively little awareness of Antarctic Treaty requirements amongst the ship's officers and tourist guides. Incomplete Treaty documentation was carried on the vessel and no EIA had been drawn up. Neither the ship's staff nor the science specialist were sufficiently aware of SPAs and SSSIs, and it was observed that SSSI 21e was unwittingly entered by 53 passengers from *"Europa"*.

Conclusions

It is strongly recommended that vessels of this size and configuration, and which have little or no experience of Antarctic conditions, should be discouraged from operating in the Antarctic Treaty Area.

MS "EUROPA" – Technical Specifications

Port of registry	Bremen, Germany
Managing owners	Hapag-Lloyd
Vessel built	1981
Dimensions	l o a: 199.5m beam: 28.5m draught: 8.4m
Tonnage	37,012 gross
Propulsion	Two 14,500 kw diesels driving fixed pitch propellers
Stabilisers	Denny Brown type
Navigational equipment	Wide range of modern equipment including GPS, 3cm and 10cm radars, ARPPA, LORAN, DECCA
Full capacity	Total 2,600 tonnes, bunker
Environmental equipment	Single-stage incinerator 800-1,000°C. Waste shredder. Separator used for oily water

SUMMARY TABLE OF DATA ON ANTARCTIC STATIONS

	REPUBLIC OF KOREA	SPAIN	UNITED KINGDOM	
	King Sejong Year-round Station	Juan Carlos I Summer only Station	Faraday Year-round Station	Rothera Year-round Station
Purpose	Scientific research	Scientific research	Scientific research	Support of scientific field activities
Capacity (persons)	14 (W) * 25 (S) *	12	24	76 (max) 70 (S), 15 (W)
Screening: Medical Psychological	 Yes Yes (Winter)	 By own doctor No	 Medical and dental No	 Medical and dental No
Training	At home, on base	At home, on base	At home, on base	At home, on base
Surgery	No	No (Pharmacy)	Yes	Yes
Doctor	Yes	No	Yes	Yes
Helipad	Yes	No, landing possible	No, landing possible	Yes
Airstrip	No	No	No	Yes, 900m
Jetty	Yes, small ship	No	Yes, small boats	Yes, 60m
Electricity generation	3 x 113 kw 2 x 275 kw	2 x 24 kw	3 x 96 kw	3 x 160 kw
Fuel (Consumption per year)	260,000 litres	12,000 litres	125,000 litres	170,000 litres (power) 140,000 litres (heat)
Fire-fighting	Fire detection in some areas, extinguishers	Water pumps and fire extinguishers	Extensive protection and training Fire watch at night	Extensive protection, equipment and training Fire watch at night

*Note: (W) Winter
(S) Summer

	REPUBLIC OF KOREA	SPAIN	UNITED KINGDOM	
	King Sejong Year-round Station	**Juan Carlos I** Summer only Station	**Faraday** Year-round Station	**Rothera** Year-round Station
Oil spill preparation	Plan exists, but no equipment yet	Some	Yes, new equipment	Yes
Sewage treatment	Yes, biological and chemical	Yes, biological and chemical	No	Maceration
Waste separation	Yes, after collection	Yes	Yes	Yes
Burning	Single stage incinerator	Two stage incinerator	Some open burning	Some open burning
Emergency accommodation	Yes	Yes	Yes	Yes
Recent oil spills	17,600 litres Nov 1991	No	Twice, 1,200 litres March 1992 1,800 litres April 1992	800 litres, 1991
Fuel storage	Steel tanks, single walled, no protection	Bladders, no protection	2 sectional tanks, no protection	6 steel tanks, with berm for full capacity

SUMMARY TABLE OF DATA ON ANTARCTIC STATIONS

	BRAZIL	CHILE	ARGENTINA
	Comandante Ferraz Year-round Station	**Arturo Prat** Year-round Station	**Esperanza** Year-round Station
Purpose	Scientific research	Logistics presence, Scientific research	Logistics presence, Scientific research
Capacity (persons)	33	9 15 (S)	45
Screening: **Medical** **Psychological**	 Yes Yes	 Yes Yes	 Yes Yes
Training	At home, on base	At home, on base	At home, on base
Surgery	Yes	Yes	Yes
Doctor	Yes	No	Yes
Helipad	Yes	Yes	Yes
Airstrip	No	No	Ski-way
Jetty	No	Yes	Yes
Electricity generation	4 x 150 kw	3 x 40 kw	2 x 150 kw 1 x 96 kw
Fuel **(Consumption per year)**	240,000 litres (diesel) 3,000 litres (petrol)	80,000 litres	220,000 litres
Fire-fighting	No fire detection system, extinguishers	Extinguishers, alarm, fire-watch	Extinguishers

	ARGENTINA	USA	POLAND	SPAIN
	San Martin Year-round Station	**Palmer** Year-round Station	**Arctowski** Year-round Station	**Gabriel de Castilla** Summer station
Oil spill preparation	Some	Yes	Yes, specific training and materials	No
Sewage treatment	No	Maceration	Septic tank	Biological and chemical
Waste separation	Yes	Yes	Yes	Yes
Burning	Open burning, incinerator soon	No	Open burning, incinerator to be installed	Open burning
Emergency accommodation	Yes	Yes	Yes	Yes, at 2 km
Oil spills	No	3,400 litres October 1992	No	No
Fuel storage	Bladders, being replaced by steel tanks	2 steel tanks, no berms, possibility of transfer	1 double wall steel tank of 1,000 litres capacity, no berm	Drums

SUMMARY TABLE OF DATA ON ANTARCTIC STATIONS

	ARGENTINA	USA	POLAND	SPAIN
	San Martin Year-round Station	**Palmer** Year-round Station	**Arctowski** Year-round Station	**Gabriel de Castilla** Summer-only Station
Purpose	Scientific research and surveying	Scientific research	Scientific research	Scientific research and surveying
Capacity (persons)	20	43	25 (+5) 11:12 (W)*	12
Screening: **Medical** **Psychological**	 Yes Yes	 Yes, also dental Yes (Winter)	 Yes Yes (not all)	 By own doctor No
Training	At home, on base	At home, on base	At home, on base	At home, on base
Surgery	Yes	Yes	Yes	No
Doctor	Yes	Yes	Yes	No
Helipad	Yes	Yes	Yes	No, landing possible
Airstrip	No	No (ski-way)	No	No
Jetty	No	Yes, small ship	No	No
Electricity generation	3 x 25 kw	2 x 250 kw 1 x 100 kw	3 x 90 kw	1 x 10 kw 1 x 25 kw
Fuel **(Consumption per year)**	45,000/50,000 litres	390,000 litres	85,000 litres (power heat)	100 litres/day
Fire-fighting	Training, good plan, extinguishers	Extensive protection, training	Training, extinguishers of various types	Extinguishers

*Note: (W) Winter

	BRAZIL	CHILE	ARGENTINA
	Comandante Ferraz Year-round Station	**Arturo Prat** Year-round Station	**Esperanza** Year-round Station
Oil spill preparation	Pending	Yes, high level preparation in near future	No
Sewage treatment	Septic tank	No , but to be installed	Maceration
Waste separation	Yes	Yes	Yes
Burning	Incinerator	Controlled open burning	Incinerator
Emergency accommodation	Yes	Yes	Yes
Oil spills	No	1979: 10,000 litres	No
Fuel storage	Steel tanks	Steel tanks,	Double-walled steel tanks

CONCLUSIONS AND RECOMMENDATIONS

1 General

The Inspection Team visited and inspected 13 occupied stations in the Antarctic Peninsula area: nine permanent stations, three summer-only stations and a small forward support station for deep-field operations on George VI Sound. In addition, three abandoned stations were inspected: one on Deception Island, South Shetland Islands and two on Stonington Island, Marguerite Bay. Three tourist vessels were inspected during the course of the Inspection Programme. These were the first such Inspections of vessels under the Terms of Article VII(3) of the Antarctic Treaty.

The Inspection Team was welcomed at all stations and there were few communication problems during the Inspection. The majority of bases and vessels were contacted in advance by radio or fax. Only in two cases was it impossible to provide prior notification although difficulties were encountered in contacting a number of bases. Although radio contact had been made the previous day with Bellingshausen Station (Russia), it was clear on arrival that the Base Commander was not aware of the intended Inspection. Because it was evident that most personnel were committed to resupply operations which were being undertaken, and since there was no fluent Russian speaker in the Team, the planned formal Inspection of Bellingshausen Station (Russia) was not proceeded with.

The checklists prepared prior to the Inspection programme were used as an aide-mémoire during Inspections and proved satisfactory. They were also valuable in allowing more objective comparisons of Inspection results to be made. The Checklists dealing with operational stations, abandoned bases and tourist vessels are appended (Annexes A to C).

The overall outcome of the Inspection Programme was positive with clear compliance with the provisions of the Antarctic Treaty. Personnel at all stations were well aware of the provisions of both the Treaty and its Environmental Protocol. No major infringements of either were recorded. Although the level of compliance was not uniform, it was apparent that a serious effort was being made everywhere.

At all stations inspected a great deal of attention was paid to health and safety aspects and environmental protection. Without exception personnel had been trained, both before going to Antarctica and on-station, in fire-fighting, waste management, first aid and, in some cases, oil pollution control . This last is timely for in recent years a number of bases have experienced sizeable oil spills (see Summary Table). Operators have in consequence become increasingly aware of the need for careful management.

Three abandoned bases were visited to check on the condition of the buildings and the possible presence of hazardous materials and other wastes. Monitoring the condition of abandoned bases is important since they are used as refuges and visited by tourists. At the three bases visited there were traces of occasional occupation and visits. The Team recommended the erection of notices to warn of hazards at such bases, particularly those visited frequently by tourist groups.

The Inspection Team also inspected three tourist vessels. Two of these were flagged with Contracting Parties and were inspected at points of embarkation or disembarkation of passengers (Article VII(3) of the Antarctic Treaty); the third was similarly inspected with the prior agreement of the vessel's owner and Master. Each vessel was complying with the waste management and oil pollution provisions of the Protocol and its Annexes. The number of tourists on board two of the vessels was comparatively small and an appropriate ratio of experienced tour guides to tourists

ensured sound management of excursions ashore. The third, much larger, vessel with about 500 passengers provided far less control and in consequence many of its tourists unwittingly entered SSSI No 21e. Also, whilst the two smaller vessels specialised in Antarctic tours, the larger was on a world cruise and had deviated into Antarctic waters for only three days.

The view of the Inspection Team was that such large tourist vessels inadequately equipped for Antarctic conditions should be discouraged from entering the Antarctic Treaty Area. Clearly, vessels with up to 900 personnel in crew and passengers pose a serious problem for search and rescue in the event of a catastrophic emergency.

2 Specific Issues

(i) Waste Management

Waste management was clearly taken seriously on all stations and vessels inspected. Wastes were dealt with in accordance with the Protocol and its Annexes III and IV. In particular:

- Wastes were separated on all stations and vessels. Only one station separated wastes after collection; all others separated wastes at source. The majority of wastes were retrograded;
- Limited open burning was still being continued, eg for large pieces of wood. The general tendency, however, was to install high temperature incinerators;
- Waste compactors were in use at most stations. At Rothera Station (UK) the commendable practice of compacting (to a ratio of 1:5) large numbers of old 205–litre fuel drums in preparation for retrograding had begun;
- Old drums elsewhere are usually retrograded as containers for other wastes;
- At Arturo Prat Station (Chile) old landfill wastes are to be excavated and retrograded. This is a commendable practice that should be followed elsewhere;
- Sewage received secondary treatment at only a minority of stations; treatment with sludges being retrograded at only a few stations. Primary maceration was used at some stations, such as Rothera Station (UK) and Palmer Station (US).

(ii) Fuel Management

Care was exercised over fuel management at all stations and was clearly of major concern to most Station Commanders. In particular:

- Bulk fuel is stored most commonly in steel tanks. Only a few stations employ double-walled tanks, others use or plan to install berms or other forms of external containment. In this respect the fuel farm at Rothera Station (UK) is an excellent example;

- The use of fuel bladders is declining, apart from very small stations where they remain the most practical storage vessel. At larger stations bladders tend to be employed for emergency storage only;
- A number of stations have experienced oil spills from pipe ruptures, incorrect use of valves, valve failures or leaks from tanks. Some spills were the result of equipment failure, others of human error. Most operators have now established clear lines of responsibility, written instructions and routine inspections of fuel systems to prevent such events;

- Some stations have the capacity to tackle localised oil spills, but oil-spill contingency planning and the provision of training and equipment to deal with larger spills needs greater attention.

(iii) Energy Sources

The majority of power at stations is supplied from diesel generators.

- Few stations employ alternative energy sources or optimise energy supply through energy saving devices, eg heat exchangers. Juan Carlos Primero (Spain) and Palmer Station (US), however, use small wind generators in some scientific projects.

- Exhaust emissions are neither filtered nor monitored at most stations. Arctowski (Poland) filters exhaust gases, oxycatalysers are fitted at Ferraz (Brazil) while Rothera (UK) Juan Carlos Primero (Spain) and Arctowski (Poland) have introduced biological monitoring schemes to assess the impact of exhaust emissions.

(iv) Emergency Response Capability

All stations had well established contingency plans to deal with major damage to station facilities. Emergency accommodation with food, power, fuel, clothing and communications equipment are provided. A notable example is the small station Gabriel de Castilla (Spain) on Deception Island, where the emergency accommodation is two kilometres away from the station because the main danger is of volcanic eruption.

All stations inspected, other than the small Spanish stations, Decepcion (Argentina) and Fossil Bluff (UK) had a doctor and surgery and could deal with minor medical emergencies locally. Provided transport was available doctors could also provide medical assistance away from the stations. Stations on King George Island had reached local agreement on Medevacs through Eduardo Frei Station (Chile).

In some cases limited assistance to combat oil spills could be provided away from stations, but even then would be heavily dependent on logistic support. Arturo Prat Station (Chile) intended to increase in 1993 its oil spill equipment and to act as a subsidiary station for the main Chilean oil spill control centre at Punta Arenas. On several stations personnel were receiving training in the use of oil-spill equipment. This is an important and commendable development in Antarctic emergency response capability.

(v) Personnel

At all stations inspected personnel had been trained before and during their stay in Antarctica. Some operators (eg Argentina and Chile) collect the team which is due to go to Antarctica up to one year prior to departure and train them according to their specific tasks.
Medical screening is done by all countries and ranges from certification of good health done by the individual's doctor to elaborate and complete screening by multi-specialist medical centres, either civilian or military. Screening includes dental screening and, for some nations, psychological screening for winter personnel.

(vi) Environmental Protection

A high level of environmental awareness existed at most stations. Personnel were invariably aware of the presence of nearby Antarctic Treaty Protected Areas and of the rules governing nature conservation and the protection of flora and fauna.

Only one station (Rothera Station, UK) had undertaken a formal Comprehensive Environmental Evaluation though environmental assessments had been prepared for activities at Arctowski (Poland), Esperanza (Argentina), King Sejong (Korea), Juan Carlos I (Spain) and Palmer Station (US). All stations indicated that, in compliance with the Protocol, EIAs would be performed in the event of new activities.

(vii) Tourism

Tourism can impact station activities and scientific research, and the Inspection Team asked specific questions of Station Commanders on this subject.

All stations require advance notification of visits by tourist and NGO expeditions, in some cases months in advance through governmental authorities. All stations imposed a limit on the number of visitors permitted ashore at any one time. Concern was expressed at some stations over the growing number of visits by small vessels, including yachts, which often provided no advance notification but nevertheless expected access and assistance.

Two stations, San Martin (Argentina) and Rothera Station (UK) are practically never visited by tourists. Most stations receive a few hundred tourists per year, but indicated that there was no particular problem. Palmer Station (US) receives on average about 1,400 tourists per year and has established clear-cut rules for such visits. A meeting with tour operators (IAATO) is held annually in Washington to plan tourist visits. At Palmer it has been evaluated that a four hour visit by a tourist vessel requires 40–50 man-hours from station personnel.

Tourism is a problem in Antarctica not so much in terms of absolute numbers, but because the areas, and stations, visited tend to be the same for obvious logistic reasons. There is growing concern amongst Antarctic operators over search and rescue aspects of tourism.

(viii) Scientific Research

The Team was impressed by the wide range of scientific research being undertaken. The high concentration of stations in some areas could, however, lead to duplication of scientific effort. This could be reduced by greater co-operation in the planning and implementation of programmes and in the selection of new sites for stations. Sharing of station facilities for common scientific programmes would reduce the problem further. This practice is commendably increasing, eg Germany and Argentina, Spain and Sweden, UK and the Netherlands.

(ix) Organisational Aspects

At the XVI ATCM (Bonn, October 1991) Treaty Parties urged greater co-operation over Inspections to increase information exchange, assist with logistics and thereby reduce costs.

The international complexion of the existing Team certainly strengthened its expertise and added an important component. It brought together contrasting cultural back-grounds and different national experiences. These, together with the wide variety of other nationals' stations inspected provided a wide exchange of views.

Although prior notification of the Inspection programme, and the composition of the Inspection Team had been sent to all relevant Contracting Parties well in advance, only one station, Juan Carlos I (Spain), had received this information from its authorities. It is recommended, therefore, that notification of inspections needs to be distributed well in advance for the information to be passed to the stations.

An Inspection Team should study well in advance relevant information on all bases to be inspected. Such information is available in the Annual Exchange of Information in accordance with Article III(1) and VII(5) and Recommendation VIII(6) of the Treaty, and also in other exchanges of information, eg under COMNAP/SCALOP. Advance preparation may save time during the Inspection.

For Inspections in the Antarctic Peninsula area it may be useful to have Checklists not only in English but also in Spanish or Russian to simplify communication.

During this Inspection about four to six hours was spent at each station. This provided enough time for an extensive interview with the Station Commander and other staff, as appropriate, followed by a tour of the station site and facilities. For stations much larger than those inspected during this programme, more time might be required.

3 Acknowledgements

The Inspection Team would like to extend its thanks to the Masters and crew and Station Commanders and personnel respectively of all vessels and stations inspected. The Team encountered a warmth of welcome and hospitality wherever it went.

A special thanks go to the Captain, officers and crew of the Ice Patrol Vessel *HMS "Endurance"*, which provided, together with its Lynx Helicopters, the logistic platform for the Inspection Programme.

The professional support given by the ship's company of *HMS "Endurance"* was a major factor in the success of this multinational inspection tour.

4 Recommendations

- That consideration be given to alternative sources of energy (solar power, wind generators etc);
- That operators review their fuel management systems and upgrade, where appropriate, their infrastructure paying particular attention to adequate safeguards for bulk storage (double-walled tanks, external berms etc), and critical review of pipework and valves;
- That more attention be given to fire safety precautions including installation of smoke detectors, night time fire watches, and provision of fire-fighting equipment;
- That more consideration be given to filtering and monitoring of exhaust gases from diesel generators, to the standards which may be agreed by Antarctic Treaty Consultative Parties;
- That more consideration be given to the removal of waste materials, including derelict vehicles and machinery;
- That greater attention be paid to abandoned stations with a view to their clean-up, removal, repair as refuges or their designation as Historic Sites or Monuments.

ANNEX A

CHECKLIST FOR PERMANENT STATIONS IN THE ANTARCTIC TREATY AREA

Name of Station: .....

Nationality: .....

(ANNEX A)

1. GENERAL STATION INFORMATION

1.1 Name of station visited: .....

1.2 Longitude: .....

1.3 Nationality of station: .....

1.4 Organisation operating the base: .....

1.5 Name of officer in charge of station: .....

1.6 Distance to the nearest neighbouring station (km): .....

2. INSPECTION DETAILS

2.1 Date of visit: .....

2.2 Time of visit: ..... Duration of visit (hrs): .....

3. SITE DESCRIPTION

3.1 Regional setting: .....

.....

.....

.....

3.2 History of the station (inc. date opened): .....

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.....

.....

.....

3.3 Primary aim of the station (logistic, scientific etc): .....

.....

.....

.....

3.4 Nearby physical facilities (eg refuges, field huts) maintained by the station: .....

.....

.....

4. STATION DESCRIPTION

4.1 Number of station buildings: .....

4.2 Area covered by station (km^2): .....

4.3 Age and condition of the buildings: .....

.....

.....

4.4 Has there been any recent construction activity? (Yes/No). If Yes then:

(a) type of activity: .....

.....

(b) area (m^2): .....

4.5 Future plans for the station: .....

.....

.....

.....

4.6 Ask if the inspection team can have a plan or sketch map of the station layout.

5. PERSONNEL

5.1 Number of personnel

(a) Total number of personnel: .....

(b) Proportion of military and civilian: .....

.....

.....

(c) Number of:

scientists/scientific technicians .....

logistic/support personnel.....

others .....

(d) Number at station: .....

(e) Number in field: .....

5.2 Maximum capacity of station:.....

5.3 Average number of summering/wintering personnel:.....

.....

5.4 Length of tour of personnel

(a) over-wintering:.....

(b) summer only: .....

5.5 Do staff undergo training courses, both prior to, and during their stay in Antarctica (safety and survival, first aid, environmental protection) (Yes/No)

If Yes, then describe:

.....

.....

.....

5.6 Do staff undergo medical or other screening?.....

.....

6. ANTARCTIC TREATY LEGISLATION

6.1 Are you familiar with the provisions of the Antarctic Treaty System? (Yes/No).....

6.2 Do you hold relevant Antarctic Treaty documentation on the station?

.....

6.3 Has your organisation developed guidelines or a management plan to ensure that station personnel comply with the Antarctic Treaty and the measures agreed under it? (Yes/No)

If Yes, ask if the inspection team can have a copy of the guidelines or management plan.

7. SCIENTIFIC RESEARCH

7.1 Main scientific programmes supported by the station: .....

.....

.....

.....

.....

7.2 Are there dedicated scientific facilities (computers, laboratories, permanent equipment eg seismographs, met stations). If Yes, then type of facilities: .....

.....

.....

.....

.....

7.3 Background of scientists (affiliation, experience): .....

.....

.....

.....

7.4 The level of international scientific activity at the station: .....

7.5 Foreign scientists (number, nationality, scientific programmes): .....

.....

.....

7.6 Are radioisotopes used in scientific investigations? (Yes/No) If Yes, then describe:

.....

.....

8. STATION FACILITIES

8.1 Water supply

(a) How is water supplied and stored (snow melt, pump from water source, distillation, reverse osmosis)?

.....

.....

(b) How much is produced (litres/day)? .....

8.2 Power generation

(a) Number, type and capacity (kw) of generators: .....

.....

.....

(b) Annual fuel consumption (volume): .....

(c) Are heat and energy cogeneration and conservation measures used (thermal insulation)? (Yes/No)

If Yes, then describe:

.....

.....

(d) Are alternative energy sources used (wind, solar)? (Yes/No)

If Yes, then describe:

.....

.....

(e) Are emissions filtered and monitored: (Yes/No)

If Yes, then how often and by what means?: .....

.....

8.3 Hazardous chemicals

(a) Types and quantities of chemicals: .....

.....

.....

.....

(b) How are they stored?.....

(c) How are hazardous chemicals monitored (marking, inspection, inventory)?

.....

8.4 Fuel storage and pumping systems

(a) Types and amounts of fuel

— Diesel (litres): .....

— Petrol (litres:.....

— Aviation fuel (litres):.....

— Other (heavy fuel oil) (litres):.....

(b) Types and capacity of station storage containers

— Steel tanks (m^3) :.....

— Bladders (m^3):.....

— Drums (m^3): .....

(c) For what purposes is the fuel used (generators, vehicles, aircraft, refuelling visiting vessels)?

.....

.....

(d) Protection against leaks and spills.

— Are there double-walled tanks? (Yes/No)

If Yes, give details (capacity).....

.....

— Are there berms around tanks? (Yes/No)

If Yes, give details (berm construction and capacity):.....

.....

— Is spare fuel storage capacity available in the event of malfunction?

.....

(e) Is there any protection against differential settlement of tanks and piping due to uneven warming of permafrost? (Yes/No)

If Yes, give details (gravel pads, sealing of ground under tanks, flexible couplings on pipes):

.....

.....

Background information on fuel pipe-work. (Is piping above/below ground, gravity feed or pumped, insulated/heated, isolated by valves (manual or automatic)?:

.....

.....

.....

(f) Are there field fuel depots? (Yes/No)

If Yes, give details (No. of drums, type of fuel, quantity (litres)): .....

.....

(g) How is bulk fuel transferred (barge and short fuel line, direct pumping from re-supply ship via long fuel line)?

.....

.....

After transfer are fuel lines blown through to empty them? (Yes/No)

If Yes, describe method: .....

.....

(h) Are fuel pumping systems and storage tanks monitored? (Yes/No)

If Yes, then how often and by what means? .....

.....

.....

(i) Who is responsible for fuel management? .....

.....

.....

9. TRANSPORT

9.1 Number and type of ground vehicles: .....

.....

.....

.....

Are there roads within or leading from the station? (Yes/No)

If Yes, then: (a) length (km): .....

(b) type (crushed rock, ice): .....

(c) comment on usage: .....

.....

9.2 Number and type of small craft: .....

.....

.....

.....

Are there any shipping facilities (jetty)? (Yes/No)

If Yes, then: (a) potential berthing capacity.....

(b) type (metal, wood): .....

(c) comment on usage: .....

.....

9.3 Number and types of fixed and rotary wing aircraft: .....

.....

.....

.....

9.4 Number of aircraft movements per year.

(a) own operations: .....

(b) operations of other Treaty Parties:.....

.....

(c) other (tourism and NGO) operations.....

.....

9.5 Are there any landing facilities (airstrips, helipads)? (Yes/No)

If Yes, then: (a) potential operational capacity (size of aircraft):.....

(b) type (crushed rock, ice) .....

(c) frequency of use:.....

9.6 What is major use of the facilities? (support of field science, logistics, personnel):

.....

10. RE-SUPPLY

10.1 How often is the station re-supplied (visits/year)? .....

.....

10.2 How is the re-supply accomplished (sea, air)?.....

.....

11. COMMUNICATIONS

(a) Are there any new communication facilities not covered by the SCALOP Exchange of Information?

.....

.....

12 FIREARMS/EXPLOSIVES

12.1 Are firearms held on the station? (Yes/No)

If Yes, then: (a) number, type and bore: .....

(b) for what purposes are they used? .....

.....

(c) details of ammunition kept: .....

.....

.....

12.2 Are explosives held on the station? (Yes/No)

If Yes, then (a) amount (kg) and type: .....

.....

.....

(b) for what purposes are they used? .....

(c) details of storage: .....

.....

13. MILITARY SUPPORT ACTIVITIES

13.1 Do the military services provide support in any way to the station? (Yes/No)

If Yes, then describe: .....

.....

.....

.....

.....

14. EMERGENCY RESPONSE CAPABILITY

14.1 Medical facilities

(a) Is there an evacuation plan for medical emergencies? (Yes/No)

If Yes, ask if the inspection team can have a copy.

(b) Does the station have a medical surgery? (Yes/No)

If Yes, give details: .....

.....

(c) Is a doctor permanently on the station? (Yes/No)

(d) Could the station provide assistance (personnel, equipment) in the event of a medical emergency nearby? (Yes/No)

If Yes, what could be provided? .....

.....

14.2 Fire

(a) Is there a fire emergency plan? (Yes/No)

If Yes, ask if the inspection team can have a copy?

(b) Does the station have equipment to deal with a fire (extinguishers, sprinkler system, breathing apparatus)? (Yes/No)

If Yes, give details: .....

.....

(c) Are personnel trained in fire fighting? (Yes/No)

If Yes, give details: .....

.....

(d) Are fire fighting exercises carried out on the station? (Yes/No)

If Yes, how often (exercises/year)? .....

14.3 Pollution (oil and chemical spills)

(a) Is there an oil and chemical spill contingency plan? (Yes/No).

If so, how often is it updated?.....

(If Yes, ask if the inspection team can have a copy.

(b) Does the station have equipment and materials to deal with a pollution incident pumps, booms, absorbents)? (Yes/No)

If Yes, give details: .....

.....

(c) Are personnel trained to deal with fuel and chemical spills? (Yes/No)

If Yes, give details: .....

.....

(d) Are pollution control training exercises carried out by the station? (Yes/No)

If yes, how often (exercises/year)? .....

.....

(e) Could the station provide assistance (personnel, equipment) in the event of a pollution incident nearby? (Yes/No)

If Yes, what could be provided?.....

.....

14.4 Have there been any incidents in the last year resulting in significant damage to station facilities or to the environment (fires, oil spills)? (Yes/No)

If Yes, then what and when?.....

.....

.....

Are incidents reported (fires, oil spills)? (Yes/No)

If Yes, describe reporting mechanism:.....

.....

.....

15. WASTE MANAGEMENT

15.1 Does the station have a waste management plan for the separation, reduction, collection, storage and disposal of wastes (paper, plastic, glass, metals, chemicals)? (Yes/No)

If Yes, can a copy be made available to the inspection team?

15.2 (a) Is training provided on the need to minimise the impact of wastes on the environment?:

.....

(b) Are there any notices publicly displayed concerning waste management?: .....

.....

15.3 How do you dispose of:

(a) Radioactive materials?: .....

(b) Electrical batteries?: .....

(c) Fuel (both liquid and solid) and lubricants?: .....

.....

(d) Wastes containing harmful levels of heavy metals or acutely toxic or harmful persistent compounds (hazardous waste, chemicals)?: .....

.....

(e) PVC, polyurethane and polystyrene foam, and rubber?: .....

.....

(f) Other plastics?: .....

(g) Treated wood?: .....

(h) Fuel drums?: .....

(i) Other solid, non-combustible wastes?: .....

.....

(j) Residues of carcasses of imported animals?: .....

.....

(k) Laboratory cultures of micro-organisms and plant pathogens?: .....

.....

(l) Introduced avian products?: .....

(m) Sewage and greywater?: .....

.....

(n) Waste produced by field parties?: .....

15.4 Current and past waste disposal techniques:

(a) Landfill or to an ice pit? (Yes/No).

If Yes, then describe: .....

.....

.....

(b) Sea/ice discharge? (Yes/No).

If Yes, then describe: .....

.....

.....

Is effluent (sewage, greywater) treated and monitored? (Yes/No).

If Yes, then describe: .....

.....

.....

(c) Open burning? (Yes/No)

If Yes, then describe: .....

.....

.....

What do you do with the ash?: .....

.....

What alternatives to open burning will be introduced by 1998/99?: .....

.....

(d) High temperature incineration? (Yes/No).

If Yes, then describe: .....

.....

.....

Are emissions controlled or monitored? (Yes/No).

If Yes, then describe: .....

.....

What do you do with the ash?: .....

.....

(e) Removal to another Antarctic station? (Yes/No).

If Yes, then describe (name of station): .....

.....

.....

(f) Removal from the Treaty Area? (Yes/No).

If Yes, then describe: .....

.....

.....

Where is the final destination of the waste and how is it finally disposed of?:

.....

How much is returned each year?:

Solid (kgs): .....

Liquid (litres): .....

(g) Are any wastes recycled? (Yes/No)

If Yes, then describe: .....

.....

15.5 Who is in charge of waste management on the station?: .....

.....

15.6 Is an annual waste management plan prepared? (Yes/No)

If Yes, then describe: .....

.....

.....

15.7 Has an inventory of the locations of past activities (abandoned bases, lost fuel depots) been prepared? (Yes/No).

If Yes, then describe: .....

.....

.....

15.8 Are past activities being, or prepared to be, cleaned up? (Yes/No).

If Yes, then describe clean-up programme: .....

.....

.....

.....

16. ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

16.1 Has an EIA been prepared for the station or associated structure or activity (eg new laboratory)? (Yes/No).

If Yes, then may the inspection team have a copy?

16.2 Are EIAs planned for the station or for future activities? (Yes/No).

If Yes, then describe: .....

.....

.....

16.3 Are you monitoring the environmental impact of the station or associated activities in any way? (Yes/No).

If Yes, then describe: .....

.....

.....

.....

.....

16.4 What key environmental indicators are you monitoring (sediment, plants, penguins) to assess environmental impact?

(a) .....

(b) .....

(c) .....

17. CONSERVATION OF FLORA AND FAUNA

17.1 Are base personnel made aware of the rules relating to the conservation of Antarctic wildlife and protected areas? (Yes/No).

If Yes, ask if the inspection team can have a copy.

17.2 Have any native mammals or birds been killed, injured, captured, handled, molested or disturbed? (Yes/No).

If Yes, then describe: .....

.....

.....

Were permits issued? (Yes/No). For what reasons? .....

.....

.....

17.3 Has there been a significant impact on plants and animals in the vicinity of the base?

.....

.....

Were permits issued? (Yes/No). For what reasons? .....

.....

.....

Are alien species or animals present? (Pets or ornamental plants)? (Yes/No)

If Yes, are they the subject of permits? .....

.....

17.4 Are there important wildlife or plant sites nearby (penguin and seal colonies, moss banks)? (Yes/No).

If Yes, then describe: .....

.....

.....

18. PROTECTED AREAS

18.1 Do you have any areas protected under the Antarctic Treaty System near the station (SPAs, SSSIs, ASPAs, ASMAs, Historic Sites and Monuments)? (Yes/No).

If Yes, then provide name, site number and distance from station (km): .....

.....

.....

.....

.....

Do you have copies of the relevant management plans? (Yes/No).

Do you have maps of protected areas nearby? (Yes/No).

18.2 Have base personnel entered protected areas within the past year? (Yes/No)

Were permits issued? (Yes/No) For what reasons?: .....

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.....

.....

18.3 Have you had any problems with station personnel or visitors observing the restrictions of protected areas? (Yes/No)

If Yes, then describe: .....

.....

18.4 Are the boundaries of protected areas marked? (Yes/No)

If Yes, then how?: .....

.....

.....

18.5 Has any monitoring or management of nearby protected areas been carried out? (Yes/No).

If Yes, then describe: .....

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19. TOURISM

19.1 Do you have visits from tourists or non-governmental expeditions? (Yes/No).

If Yes, how many (a) people per year? .....

(b) cruise ships per year? .....

(c) yachts per year? .....

(d) aircraft per year? .....

19.2 Has your organisation developed procedures to deal with tourist visits? (Yes/No).

If Yes, ask if the inspection team can have a copy of the procedures.

19.3 Have tourists caused any operational problems for the station or had an environmental impact? (Yes/No).

If Yes, then describe: .....

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20. FURTHER NOTES

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ANNEX B

CHECKLIST FOR ABANDONED BASES

— Name of base? .....

Location? .....

— What is nationality of abandoned base/ installation? .....

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— Date abandoned if known: .....

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— Description of facilities present (No, size buildings, fuel storage, jetties etc).

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— Any evidence of clean-up, the removal of structures or reinstatement activities. Presence of notices warning of hazards?

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— What is the physical condition of buildings/installations? Are they secured? Could the base be used as an emergency refuge? Any food supplies? Do the buildings constitute a hazard to people or wildlife? Are they likely to in the near future? Does wildlife locally appear impacted?

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— Has the site been colonised by wildlife (species, numbers)? .....

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— Is there any evidence of fuels, chemicals still held at the base? What quantities (estimates) and types of fuel? What is the condition of fuel storate? Is it exposed to the elements or under cover? Is there any sign of fuel/chemical leakage?

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— Are there any rubbish dumps or empty fuel drums? What types of waste? What condition? What quantities (estimates)?

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— Is there evidence that the site is, or has been, visited by tourist or NGO groups?

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— Are there signs of vandalism, theft?.....

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— Are there any Antarctic protected areas within or near the abandoned base area?

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— Does the base, or nearby area, contain any notable historic artefacts (eg 1940s/50s ration boxes, skis, sledges)?

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ANNEX C

CHECKLIST FOR TOURIST (OR OTHER) VESSELS

1. An Inspection should bear in mind that:

— only a vessel flying the flag of a Treaty Party can be inspected (or any other vessel with the consent of its owner);

— and then only under the conditions of Article VII(3) of the Antarctic Treaty, viz 'at points of discharging or embarking cargoes or personnel ...'. Inspections of vessels on the High Seas or whilst underway is not permitted under the Treaty.

2. An Inspection should concentrate on three aspects:-

(a) observance of wildlife and Protected Areas regulation;

(b) waste disposal;

(c) prevention of marine pollution.

Information will need to be collected from a number of personnel, key amongst whom may be the Ship's Master (general information), Tour Leader (item (a)), First Officer (item (b)) and Chief Engineer (item (c)).

3. **General Information - Interview Ship's Master**

— Name of vessel: .....

Port/nationality of Registration: .....

Owner and address (and/or authority contracted to): .....

.....

Age of vessel: .....

Basic dimensions (1 o a, breadth, draught, gross tonnage): .....

Propulsion type (eg diesel electric) whether single/twin screw, bow/stern thrusters, whether ice strengthened:

.....

Marine classification:.....

Navigational and other equipment held (GPS, radar, navtex, satellite weather/ice imagery) presence:

.....

Number and standard of Zodiacs and other small craft: .....

Presence/type/age of helicopter(s): .....

— Name/nationality of Captain: .....

Number/nationality of crew: .....

Maximum carrying capacity (visitors):.....

Number of visitors at time of inspection: .....

Number of cruises undertaken/planned that season: .....

Length of operating period in Antarctica:.....

Area of operation:.....

Limitations on operation (eg by geographical extent, ice conditions): .....

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— Are the expedition leaders, guides, officers and crew qualified, well-trained and experienced? [IAATO recommend that at least 75% of officers and crew have Antarctic experience.]

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— How many visits made to research stations each season? .....

Number and nationality of stations? .....

How are visits arranged (before cruise by fax/letter, during cruise by radio)? [IAATO recommend 72 hours advance notice and a 24-hour advance final confirmation to stations.]

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— Have any problems been encountered during such visits? .....

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— Whether there exists an emergency response plan and if so what back up is provided?

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— Does the vessel have insurance in case of an emergency?.....

If so, how is the insurance arranged and for what amount?:

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— Ice/Antarctic experience of crew/officers.

Is an 'ice pilot' carried?.....

Is training given to crew/tourists on Antarctic conditions (safety, life-boat drills)?

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— Does the vessel carry adequate and up to date hydrographic charts?

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— Has an EIA been prepared for the vessel's activities? If so, ask for a copy

— Does the vessel/tour organiser report to the Governments whose stations they have visited, after completion of the tour cruise?

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If so, what information is provided?

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— Is the tour organiser/ship owner a member of the International Association of Antarctic Tour Operators (IAATO)?

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(ANNEX C)

(A) WILDLIFE and PROTECTED AREAS – Interview tour leader

— Are crew/tourists made aware of regulations of Antarctic Treaty system (Treaty, Agreed Measures and Environmental Protocol – concerning wildlife conservation, Protected Areas and environmental sensitivity generally)?:

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— In what form is this advice provided (lectures, literature, on site, other)?

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— Is relevant Treaty documentation carried by the vessel?

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— Is vessel aware of the location, boundary, management plans and regulations of Protected Areas (SPAs, SSSIs etc)?

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— Is tour operator aware of the Codes of Guidance prepared by the Antarctic Treaty Parties, COMNAP and SCAR?

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Are these followed? .....

Has operator prepared its own Code of guidance (if so, obtain copy)?

Are the IAATO guidelines of Conduct for Antarctic Visitors used? .....

— Does the operator invoke any other form of regulation over tourists/crew (eg standards of US domestic law - US Antarctic Conservation Act of 1978)?

.....

.....

— Does vessel carry tour guides, if so, how many? .....

What is the ratio of guides to visitors/crew?.....

Are the IAATO guidelines of one qualified tour guide to every 20 to 25 passengers followed?

.....

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— What criteria are used for selecting guides? (Do they require to have experience of Antarctic conditions, conversant with Antarctic wildlife and conservation and Treaty law, ability in inflatable boat handling)?

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— Does the tour operator provide training to guides in such matters?
If so, what form does this training take (lectures, 'hands-on' training, literature)?

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.....

— How many visits to wildlife sites/stations are made per cruise? .....

.....

— What is the usual duration of such visits? .....

— How many personnel are allowed ashore at each visit (particularly to wildlife sites)?

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What is the ratio of guides to tourists/crew during visits ashore? .....

Are the IAATO guidelines of a maximum of 100 passengers ashore at a time followed?

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— How does operator ensure minimum impact of tourists on such wildlife sites?

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— Is there any evidence of infractions by tour operator, tourists or crew against Treaty regulations?

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— Are any special precautions taken to prevent the vessel from accidentally introducing alien species to the Antarctic (animals, plants, insects, bacteria)?

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— Are tourists/crew told not to damage or tamper with historic monuments, refuges, scientific markers and equipment?

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(B) WASTE MANAGEMENT and DISPOSAL – Interview First Officer

— Does the vessel have a waste management plan for the separation, reduction, collection, storage and disposal of wastes (paper, plastic, glass, metals, chemicals)?
If so, obtain a copy.

— Is there a designated waste management officer/member of crew? .....

— How are liquid, combustible and non-combustible wastes dealt with?

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.....

— How do you dispose of:

(a) Radioactive materials?:.....

(b) Electrical batteries? .....

(c) Fuel (both liquid and solid) and lubricants?:.....

.....

(d) Wastes containing harmful levels of heavy metals or acutely toxic or harmful persistent compounds (hazardous waste, chemicals)?.....

.....

(e) PVC, polyurethane and polystyrene foam, and rubber?:.....

.....

(f) Other plastics?.....

(g) Treated wood?: .....

(h) Fuel drums? .....

(i) Other solid, non-combustible wastes?.....

.....

(j) Residues of carcasses of imported animals?.....

.....

(k) Laboratory cultures of micro-organisms and plant pathogens?.....

.....

(l) Introduced avian products?.....

(m) Sewage and greywater?.....

.....

(n) Waste produced by field parties?.....

— Is effluent (sewage, greywater) treated and monitored (amounts recorded)? .....

.....

If so, what type of sewage treatment plant is used?.....

Does the vessel keep a sewage record book?.....

Does vessel employ a comminutor for food wastes? .....

What is the storage capacity (cubic m and average holding time) for food wastes, greywater and sewage?

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.....

How are food wastes which are difficult to comminute (large boxes, fish skins) disposed of?

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— Is the vessel aware of the Protocol and MARPOL Regulations concerning the discharge of food wastes and sewage (see Articles 5(3) and 6(1) of Annex IV). [Comminuted food waste and untreated raw sewage are prohibited from being disposed of within 12 nautical miles of shore.] .....

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— Does the vessel have a compactor and/or shredder? .....

How is shredded or compacted waste stored on board? .....

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— Does the vessel have an incinerator? .....

If so, obtain details - single/twin stage incineration, operating temperature, amount combusted (kg/day)?

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Are emissions monitored? .....

If so, how and when? .....

What happens to the ash? .....

— Where is material removed from the Antarctic Treaty Area taken to? .....

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Where and how is it finally disposed of? .....

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Does the vessel/operator have a formal contract with a port reception facility?

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.....

Are any wastes recycled? .....

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— How much is retrograded (tonnes or cubic capacity) of solids and liquid?

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— Is advice provided to crew and tourists on the need to minimise the impact of wastes on the environment (both whilst on vessel and whilst ashore)?

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— Are there any notices publicly displayed concerning waste management?

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(C) PREVENTION OF OIL POLLUTION – Interview Chief Engineer

— What quantities and types of fuel are carried? .....

— Is bulk fuel in double-walled tanks? .....

Can fuel be transferred from tanks in the event of an incident to empty tanks?

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— Does the vessel have an oil spill contingency plan? .....

How up to date is it? .....

How often is it revised? .....

Obtain a copy if possible.

— Does the vessel carry oil pollution equipment and materials to deal with a pollution incident (booms, pumps, absorbents)?

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— Is there a dedicated fuel management/pollution officer or crew member?

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— Are officers/crew trained to deal with oil pollution incidents? .....

Are training exercises held? .....

— Is the vessel aware of the oil prevention measures of the Environmental Protocol?

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Is the vessel flagged with a signatory State to MARPOL? .....

Is the vessel aware of the IMO Special Area provisions for Antarctica?.....

— Where does the vessel discharge its oily residues (sludge, contaminated bilge water etc)?

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Does the vessel have a formal contract with a port reception facility outside the Antarctic Treaty Area?

.....

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— Does the vessel have adequate tank capacity to retain on board all oil residues etc whilst in the Treaty Area?

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— Does the vessel keep an Oil Record Book?.....

How often is it updated?.....