



UNITED STATES DEPARTMENT OF STATE

UNITED STATES-RUSSIA JOINT INSPECTION TEAM



U.S.-RUSSIAN REPORT OF INSPECTIONS UNDER ARTICLE VII OF THE ANTARCTIC TREATY AND ARTICLE 14 OF THE PROTOCOL ON ENVIRONMENTAL PROTECTION

JANUARY 23-28, 2012



Concordia (France/Italy)
Mario Zucchelli (Italy)
Scott Base (New Zealand)



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Ross Sea Ice

PART I – INTRODUCTION

The U.S.-Russia Joint Antarctic Inspection was conducted from January 23 – 28, 2012. This is the first joint inspection conducted by either country and the first Antarctic inspection conducted by the Russian Federation. This was the thirteenth inspection conducted by the United States since the signing of the Antarctic Treaty in 1959. This report summarizes the observations and conclusions of the joint inspection team.

The inspection was conducted pursuant to Article VII of the Antarctic Treaty of 1959 and Article 14 of the Protocol for Environmental Protection to the Antarctic Treaty. The purpose of the inspection is to promote the objectives and ensure the observation of the provisions of the Antarctic Treaty. The U.S.-Russian team reviewed adherence by Treaty Parties to their obligations, including with respect to limiting environmental impacts, ensuring that Antarctica is used only for peaceful purposes and that Parties honor the prohibition on measures of a military nature.

The joint inspection team members came from multiple U.S. and Russian federal agencies and institutions, including the U.S. Department of State, the Russian Ministry of Foreign Affairs, the United States National Science Foundation (NSF) and the Russian Antarctic

Expedition. The team members were:

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The joint inspection team arrived in the Antarctic Treaty Area from Christchurch, New Zealand on January 23. The team inspected Scott Base (New Zealand), Concordia (France/Italy) and Mario Zucchelli Station (Italy). The inspection concluded on January 28, 2012.

The Antarctic Treaty, signed in Washington in 1959, reserves the continent of Antarctica exclusively for peaceful purposes. Moreover, it places science at the heart of international cooperation on the continent by guaranteeing freedom of scientific research, including the sharing of research and scientific information. It prohibits all military measures, including the testing of weapons, the explosion of nuclear materials, and the disposal of radioactive waste. The Treaty also provides a mutually agreeable arrangement for the issue of territorial claims in Antarctica. The United States and Russia played major roles in the negotiation of this Treaty and participate actively in all aspects of the Antarctic Treaty system. The Treaty has 50 parties, 28 of which are conducting significant research on the continent, thus entitling them to the status of Consultative Party with the right to name inspectors.

The Environmental Protocol, which was signed in 1991 and came into force in 1998, designates Antarctica as a “natural reserve, devoted to peace and

science.” It supplements the Antarctic Treaty’s basic provisions applicable to human activity in Antarctica and prohibits all activities related to Antarctic mineral resources, with the exception of scientific research.

The U.S. Department of State coordinates U.S. policy on Antarctica in cooperation with the National Science Foundation, the federal agency that administers the U.S. Antarctic Program, and other federal agencies. It leads diplomatic efforts within the framework established by the Antarctic Treaty.

The Ministry of Foreign Affairs of the Russian Federation ensures implementation of the Antarctic Treaty and reviews all the related political aspects, both national and international. The Russian Antarctic Expedition, as a specialized body within the Russian Federal Service on hydrometeorology and environmental protection, manages national governmental activities in Antarctica.

ACKNOWLEDGEMENTS

The inspection team greatly appreciates the support of the National Science Foundation and its U.S. Antarctic Program, particularly the staff of the United States’ McMurdo Station, who provided essential logistical support for the inspection.



Prince Albert Mountains in Victoria Land

— PART II – GENERAL CONCLUSIONS —

The team was grateful for the cooperation provided by all three inspected stations. Each of the stations was well managed and impressive in terms of their general facilities, professional character and dedication to science.

All three stations visited demonstrated a high level of compliance with the Antarctic Treaty system rules. These stations conduct a wide range of Antarctic scientific research, including terrestrial and marine biology, astronomy, glaciology, oceanography, environmental monitoring, seismology, meteorology and climatology, to name only a few. They also demonstrated a keen interest in promoting and advancing international scientific collaboration and have hosted a number of foreign scientists in recent seasons. The team was impressed with the high level of sensitivity to protecting the Antarctic ecosystem.

Also notable was the emphasis placed by Concordia and Scott Base in particular on energy and water efficiency, as both stations were upgraded recently. Scott's use of renewable wind energy to provide for almost all of its energy needs and cooperative energy relationship with McMurdo Station substantially reduced its use of hydrocarbons. Both Concordia and Scott Base have developed energy monitoring systems to maxi-

mize efficiency and reduce consumption. Concordia and Scott Base also have established a comprehensive water recycling system that significantly reduces overall water usage.

Zucchelli, a comparatively older station, and field camps operated out of Scott Base have not benefited from similar modernizations or efficiencies. Zucchelli's management indicated that the station is totally reliant on hydrocarbons for power, although Italy has begun to look at the possibilities of using solar panels or wind turbines. Similarly, Scott Base indicated that its field camps have yet to utilize improved energy concepts practiced at the station.

All three stations noted the challenges of logistics and funding Antarctic programs that confront many of the Consultative Parties. As a result, the stations all demonstrated varying degrees of international logistical collaboration with other National Antarctic Programs, while also indicating strong interest in expanding these

relationships to maximize efficiencies. The stations carefully review expenditures, particularly on fuel and logistics, with an eye to identifying cost saving measures that could be applied.

Overall, the inspection team was very impressed with the operations at all three stations, which have developed best practices that could serve as a model for many national programs.

Our discussions at two of the stations – Concordia and Mario Zucchelli – raised questions concerning the ability to implement fully legal standards related to the Environmental Protocol. We were informed that Italy does not have implementing laws or regulations related to the Protocol. As discussed in the report, this has implications for ensuring compliance with environmental rules by Italian citizens and by non-Italians participating in Italian science projects in Antarctica.



Landscape



Hillary Field Center, Scott Base, Ross Island

— PART III —

ANTARCTIC STATION INSPECTION REPORTS

NEW ZEALAND - SCOTT BASE

77° 51' S, 166° 46' E

JANUARY 24, 2012

Scott Base is the only research station operated by Antarctica New Zealand and is the logistical hub for New Zealand-supported scientific activities in Antarctica and the Southern Ocean. Antarctica New Zealand is a Crown Entity with a Ministerial-appointed board and structure. Antarctica New Zealand is funded through the Ministry of Foreign Affairs and Trade and the Ministry advises the Minister of Foreign Affairs on its overall performance. Operated as a year round station since its establishment in 1957, Scott Base has had one major upgrade and numerous small-scale refurbishments over the last 50 years and is a modern and efficient facility.

The joint team began its five-hour inspection at Scott Base on Tuesday, January 24, 2012 at 12 p.m. Dr. Ed Butler, Senior Antarctica New Zealand Representative and Manager of Antarctic Science, led the discussion and provided a tour of Scott's facilities. The team had

intended to provide two days' notice in advance of the inspection, but when weather prevented the team from flying to Mario Zucchelli Station, Scott Base graciously welcomed the team on the same day as the original notification.

PHYSICAL DESCRIPTION

Scott Base is composed of a series of connected structures, arranged parallel to the shore of Hut Point Peninsula of Ross Island at the southernmost point of sea ice in Antarctica (excepting Gould Bay in the Weddell Sea). One large structure (called the "hangar") is separate from the main station. A small separated building dating back to the original station is preserved as a "museum" with historical displays. A pair of small marine laboratories is also separated and located immediately along the waterfront. Scott Base is located about 1.8 miles (three kilometers) from the U.S. Antarctic Program's McMurdo Station. The two stations are connected by a robust road.

Since the construction of the station in 1957 the main station has been successively refurbished. The reconstruction program was completed five years ago. As a result the station building is a complex, unique engineering structure in which the majority of various technical services, research laboratories, and living and service quarters are situated under one roof. Such an approach has its advantages and disadvantages. Among the advantages are energy saving and comfortable working surroundings. Disadvantages include the risks and potential impact of local fires on the whole structure and related problems with evacuation. Many Antarctic stations are composed of or centered on a main central structure, and thus this “disadvantage” is one faced by many stations and can be mitigated to a large degree by administrative measures.

At this time, there are no plans to expand the footprint of the station. Antarctica New Zealand has a plan to continue to maximize station efficiencies and support for scientific operations, including during the winter season. The Government of New Zealand subsequently informed the inspection team that in 2005 the Board of Antarctica New Zealand made a decision to freeze the station footprint and that all staff share bunk rooms in summer to reduce the base footprint and demonstrate a focus on reducing use of fossil fuels.

The Inspection Team took note of the sign at the top of the road that descends to Scott Base that states “Welcome to Scott Base, Capital of the Ross Dependency.” The New Zealand Government subsequently clarified that the unauthorized sign was erected by wintering over Scott Base staff. It is not an official sign and, in its view, modifications made to it over the years (e.g. the Scott Base, population and images of satirical base activities, such as picnics) reflect the good humoured nature of the sign. Although the sign includes some facetious elements and may reflect, in part, a humorous intent, it is quite prominent. Given that the intent of the sign is perhaps unclear, and given the differing views that exist over territorial issues in the Antarctic Treaty area, relevant authorities may wish to consider whether this is the appropriate sign to mark the entrance to the station.

PERSONNEL

At the time of the inspection, 65 scientists and support personnel were at Scott Base. The station usually has

32 scientific support members during the summer season, which runs from early October to mid-February each year. Twenty-five percent of these personnel are associated with the New Zealand Defence Force. Each summer, approximately 30-40 scientific personnel are working at field camps. Scott Base has a capacity of 86 beds and controls its program to meet this maximum. As Antarctica New Zealand participates in a joint logistics pool with nearby McMurdo station and strives to run an efficient operation, the proportion of support personnel to scientific personnel may be lower than at other stations of a similar size (approximately 1:1 compared to 1:3 or 4).

In recent years, 10-11 Antarctica New Zealand staff deploy for the winter season. All personnel are required to have a medical screening prior to deployment. Antarctica New Zealand provides specific advance training on first aid, fire fighting, search and rescue (SAR), area management and environmental protection in New Zealand.

There are 2-3 trained paramedics working at Scott Base during most summer seasons, although they concurrently fill other positions. The station’s small medical room has one bed and limited equipment. Serious medical emergencies are referred to nearby McMurdo Station for treatment. There has been one medevac to Christchurch in the last ten years.

SCIENTIFIC RESEARCH

The main goals of Antarctica New Zealand’s scientific research correspond to the main modern areas of focus of the international scientific community, including those of the Scientific Committee on Antarctic Research (SCAR): life sciences, earth sciences and physical sciences. Particular lines of research are interrelated with the development of corresponding science schools and science potential of New Zealand. Multidisciplinary field research is performed at Scott Base and its field camps located within the reach of the base’s logistical support network. These research activities include physical oceanography, sea ice, studies of biodiversity of the extreme Antarctic environment, climate change, and geophysical processes in the earth’s crust and in the magnetic sphere. Some of these projects are performed year-round in the geomagnetic huts, at the points of observation and laboratories of the station, but most of them are at the

field camps operated in the summer season. In the 2011/12 season, about 35 different scientific programs were supported from Scott Base. Some projects were conducted at several field camps, while other projects were conducted at only one camp.

Measurements of the state of the environment are conducted by modern measurement equipment, some of which are integrated into international observation networks (i.e., World Meteorological Organization (WMO), International Real-time Magnetic Observatory Network (Intermagnet), Global Sea Level Observing System (GLOSS), etc.).

Representatives of several foreign Antarctic programs (Australia, Belgium, Germany, Italy, Republic of Korea, South Africa, and United States) take part in the science activities of the base. In previous years, representatives of the Czech Republic, the United Kingdom and Malaysia have also worked there. There are also a number of joint scientific projects conducted at Scott Base: sea ice research with Canada and the European Space Agency, and glaciology with the United States. In addition, New Zealand continues to take part in the ANDRILL (Antarctic Geological Drilling) project.

New Zealand's cooperation with scientists from many countries is admirable and consistent with the scientific objectives of the Antarctic Treaty. Such cooperation is also a reminder that non-parties should be encouraged to join the Treaty when their involvement, through their scientists and/or other activities, reaches a significant stage.

TOURIST AND NGO ACTIVITIES

The observers noted that the number of tourist and non-governmental activities in the Scott Base area remains quite low – one vessel called in 2010 and none in 2011, whereas in the mid-2000s the average number of calls was three to four per year. (The decline might have been caused by severe ice conditions in the area.) New Zealand government support to tourist expeditions to Antarctica is limited to humanitarian assistance and basic hospitality (such as short visits to Scott Base). Antarctica New Zealand maintains contacts with New Zealand tour operators to ensure the tourist flow is manageable and their visits are organized in accordance with Antarctic Treaty system requirements.

All outreach and journalist activity is conducted as part of the National Antarctic Program.

The team noted as well the activities of Antarctic Heritage Trust (AHT), a non-profit Charitable Trust with core corporate support funded by the New Zealand Government (Ministry of Arts, Culture and Heritage) dedicated to the preservation of four Ross Sea historic huts and artifacts. AHT's operations represent a continuous and long-term conservation project conducted in close cooperation with Antarctica New Zealand (e.g., using Scott Base's storage facilities, performing conservation works in one of the station's buildings provided to AHT). According to the Government of New Zealand, conservation funding is raised through philanthropic international donors with all logistics provided by Antarctica New Zealand under a regularly reviewed Memorandum of Understanding. Nonetheless, the team believes more information from Antarctica New Zealand on its collaboration with AHT, including issues related to control over such activities, would be appreciated.

LOGISTICS AND OPERATIONS

COMMUNICATIONS

Scott Base has UHF, VHF and HF radio with repeaters in the vicinity for voice communications, Iridium satellite phone with voice and text capability, as well as satellite voice and data links to the internet with voice, data and email capabilities.

TRANSPORT

There are numerous vehicles at Scott Base, including sport utility vehicles (SUVs), tractors, loaders, medium- and small-size over-snow vehicles, snowmobiles and quad bikes, as well as other types. New Zealand is part of a joint logistics pool with the United States, and shares use of U.S. Air Force C-17 and LC-130 aircraft and contract Twin Otter and Basler aircraft. For their contribution to the logistics pool, the Royal New Zealand Air Force operates Boeing 757 and C-130 aircraft to and from New Zealand, conducting approximately 15 total round trips annually. Scott Base also has one contract Eurocopter Type EC130 helicopter, operated and supported out of McMurdo Station.



Team Leaders Vasily Titushkin and Evan Bloom with Antarctica New Zealand Representative Ed Butler

This helicopter averages 150 missions per year with an average 1.4 hours per mission.

Scott receives cargo and fuel supplies once per year via the U.S. Antarctic Program's (USAP) resupply ships. Scott Base has no small boats.

Two marked gravel helipads are demarked close to the station, but no other aircraft support facilities are present.

In 1958 the United States and New Zealand Governments signed a joint cooperation agreement whereby the costs of operating logistics in Antarctica are shared on a pro-rata basis between the two Governments. As the two programs have developed since then, an annual review of each party's contributions is made with emphasis on what each party can bring to the joint pool and what that contribution's value is to each program. For example, New Zealand provides United States' aircraft access to Christchurch International Airport and has recently developed a three-turbine wind farm that provides approximately 15% of the joint electric load of Scott Base and McMurdo.

Scott Base benefits greatly from its proximity to and collegial relationship with USAP. This is most notable in the area of intercontinental transportation where

Antarctic New Zealand appears to have very limited ability to provide ship resupply and limited capacity for intercontinental airlift. Scott Base appears to manage its dependence on a third party (in this case, USAP) for some of its most critical operational needs through a proactive, close, and continuous relationship with the United States.

FUEL STORAGE AND USE

Four fuel tanks, each with forms of secondary containment, hold Scott Base's fuel supply. These tanks' combined capacity is 16,500 gallons (61,000 liters), which previous to the installation of the wind turbine generators (see following section on power generation) was only about one-tenth of a year's quantity of fuel. Now, this capacity equals approximately a year's worth of storage.

The four tanks are not co-located. This assists in avoiding complete incapacitation in the event of a catastrophic event. Fuel is delivered to each of these tanks by truck from McMurdo's tank farm. Scott Base's fuel is purchased and delivered through the U.S. Antarctic Program (USAP). Antarctica New Zealand remits funds directly to USAP to compensate for the fuel it draws.



Wind Turbines on Crater Hill, overlooking Scott Base

Prior to the installation of the wind turbine farm, the overwhelming portion of the fuel fed generators that provided station electricity. Now, the majority of fuel used (a mere fraction of the pre-wind-farm quantity) goes to boilers that provide station heating.

POWER GENERATION AND MANAGEMENT

Over the past three years, Scott Base has experienced a dramatic change in how it provides power for its activities. Prior to 2009, the base operated a traditional diesel engine driven power plant that operated continuously. The system provided at least simple redundancy.

At Antarctic New Zealand's instigation, a wind turbine farm (consisting of three generators) was designed, installed and commissioned jointly with USAP. The turbines came on line in December 2009. The wind turbines are located on Crater Hill overlooking Scott Base. A part of this project tied Scott Base's and McMurdo's power networks together into a "Ross Island power grid." The construction followed an Initial Environmental Evaluation (IEE) done by New Zealand that concluded:

"...the negative environmental impacts resulting from this activity will be outweighed by the positive environmental benefits. The predicted reduction in fuel usage and consequent reduction in greenhouse gases being released to the atmosphere, combined with the reduction in the risk of an environmental incident through less handling of less fuel outweigh the predicted impacts the installation of the turbines will create."

The wind turbines are providing more power than was originally expected; the three wind turbines provide 100 percent of the amount of power needed by Scott Base, and the remainder offsets the power needs of McMurdo Station. This has been a successful example of renewable energy planning in Antarctica.

WATER SYSTEMS

Scott Base utilizes a reverse osmosis plant to produce fresh water from seawater drawn by pipeline from McMurdo Sound. Processed water is piped to a family of storage tanks, where it is available for sinks, water fountains, showers and all galley functions (e.g., dishwasher). Wastewater from these devices is routed to a wastewater treatment plant. This plant uses bio-degradation, centrifuge, and filtration to purify water. The sludge is packaged for removal from the continent, and the recycled water is plumbed to station

toilets. Toilet effluent is routed back to the wastewater treatment plant for purification and repeated recycling to toilets. Waterless urinals are used throughout Scott Base.

MANAGEMENT OF DANGEROUS ELEMENTS

Station management indicated the presence of flammable liquids and liquid nitrogen used in scientific studies. Such hazardous and other toxic materials are stowed appropriately in marked lockers throughout the station. Spent chemicals and other hazardous materials (e.g., batteries) are properly packaged, documented and shipped back to New Zealand for disposal in accordance with New Zealand laws and regulations. The only item of concern (indicated by station personnel) was a switch-board inside a metal box with electric cables connected that stood nearby another metal box containing flammable liquids.

The station leader reported no firearms, radioisotopes or explosives on station. He noted that explosives used for the installation of the wind turbines were provided by McMurdo Station.

EMERGENCY RESPONSE CAPABILITY

Scott Base managers briefed the inspection team on emergency response plans, search and rescue plans, and fire-fighting capabilities. Search and rescue, fire fighting capability and emergency response are integrally linked with USAP at McMurdo, but these aspects are achieved in an equitable partnership and could be performed adequately on an independent basis. The observers learned as well that the fire incident of 2009 at Scott Base created a significant change in approach to personnel training focused on individual responsibilities for eliminating harm to persons, facilities and the environment through risk identification and management, but did not require modification of fire-safety procedures.

ENVIRONMENTAL PROTOCOL

ENVIRONMENTAL IMPACT ASSESSMENT

The observers were briefed on the rules, procedures and practices applied at Scott Base with regard to

environmental impact assessments (EIA). The station management personnel demonstrated a high degree of awareness of the requirements and also informed the observers that New Zealand authorities had recently adopted an Initial Environmental Evaluation (IEE) covering Scott Base non-science activities for the period of 2011-2015, with annual amendments to highlight any seasonal change in activity that may occur. It was explained that previously Antarctica New Zealand had submitted annual IEEs, however, due to the longevity of operations and the requirement to maintain an ongoing presence in Antarctica, it was decided to switch to a longer-term environmental impact assessment. It was also underscored that one of the advantages of such a mechanism was the ability to assess the cumulative impacts and the operation of the non-science program as a whole. This helps mitigate impacts of the annual program in a more comprehensive manner.

It was also noted that Antarctica New Zealand strictly requires private or outside applicants seeking to carry out activities at Scott Base to produce EIAs that are subject to thorough review and, if necessary, further amendments and/or redevelopment.

CONSERVATION OF FLORA AND FAUNA

The station is located on the Ross Sea, and seals, penguins and minke whales are often seen in the vicinity of the station. Personnel follow strict guidelines to maintain 10 meters' distance away from any fauna, although animals may directly approach personnel and facilities. Antarctica New Zealand issues permits for the taking of fauna for scientific purposes; in recent years this has included research on marine life (e.g., fish) and penguins.

There is a small area near the station where mosses and lichen have been identified. Although this area is not marked, station personnel are made aware of the location, and Scott Base seeks to keep the area free of human interference. Consideration should be given to making protection of this site more robust and formalized.

All staff members receive training on how to minimize the introduction of non-native species; educational posters are also present in the station. Station management reported that there have been past cases of

flies being transported from New Zealand in damaged beer shipments and that remedial systems have been installed to help prevent the release of non-native species.

Given the historical research and samples in the vicinity collected by Robert F. Scott's 1910-1912 expedition, there are data available to assist with long-term studies on the impact of Scott Base on local flora and fauna.

WASTE MANAGEMENT

The Scott Base services supervisor provided the observers with the station Waste Management Handbook. Relevant information posters on the subject are placed around the station and all Base personnel are aware of the rules of waste management.

All wastes are separated into five categories listed below:

- Recyclables;
- Hazardous;
- Domestic liquids;
- Food wastes;
- General.

All waste produced at Scott Base and in the field is returned to New Zealand for recycling and appropriate disposal. Paper, cardboard, cans, and plastic are compacted and packed for transportation. Incineration is not currently used at the station.

The only waste materials disposed in the Antarctic are domestic liquids. The base operates a biological wastewater treatment facility. Treated and disinfected water produced by the facility is recycled for use in flushing toilets, except a small amount that is released to the sea.

The area of the base is quite clean. The team observed that working and living areas in the station were clean and well-lit.

AREA MANAGEMENT

There are several Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas

(ASMAs) in the vicinity of the Scott Base (e.g. Arrival Heights, Dry Valleys). It was reported that the respective areas are marked where possible and are being regularly monitored. Since some of the protected areas are located close to regularly traversed paths, their monitoring is of special importance in comparison to more remote areas. The station leader informed the observers of several inadvertent breaches of the areas' regime (1-2 cases of trespassing per year). As reported, none of the cases caused noticeable harm to the environment.

The training provided to the personnel with regard to the environmental issues contributes to the preservation of the ASPA regime. It is worth noting as well that New Zealand has provided to the Antarctic Treaty Consultative Meeting (ATCM) its five-year reviews of the station's management plans.

ARMS AND MILITARY SUPPORT

The New Zealand Defence Force supports Scott Base by providing some military personnel to fill a number of positions. In the 2011/12 season these included: four communications operators, two heavy plant operators, one cargo handler and the Base Services Coordinator. The Armed Forces Canteen Council operates the bar and shop at Scott Base.

In addition to military personnel at Scott Base, as part of the joint logistics agreement between New Zealand and the United States, New Zealand military personnel assist with the USAP cargo ship offload. Light engineering teams are also provided by the New Zealand military on an as-needed basis to assist with general construction work.



Joint Inspection Team with Concordia Station Leaders

FRANCE/ITALY – CONCORDIA STATION

75° 06' 06" S, 123° 23' 43" E

JANUARY 25, 2012

Concordia Station, located on the Antarctic plateau at Dome C, is jointly funded, staffed and operated by France's Polar Institute (IPEV) and Italy's National Program of Research in Antarctica (PNRA - Italy) through the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) under a cooperative agreement signed by IPEV and ENEA in 1993. The station opened in 1997 with the establishment of a summer camp; construction of the year round facility was completed in 2005. As one of the newest stations in Antarctica, Concordia utilizes a number of highly efficient energy and waste management systems that could serve as a model for modernization of other Antarctic stations.

The inspection team's three and a half hour visit to Concordia began at 8 a.m. local time on Wednesday, January 25, 2012. Sergio Sgroi, Summer Station Leader (ENEA-PNRA), Claire Le Calvez, Technical and Logistical Manager (IPEV), and Eric Bondoux, Winter Station Leader (IPEV), led the discussion with the inspection team and provided a tour of Concordia's facilities. The inspection team provided three days' advance notice of the inspection.

PHYSICAL DESCRIPTION

Concordia is built at Dome C on the East Antarctic plateau and its altitude exceeds 10,600 feet (3200 meters). The remote inland location of the station provides an excellent site for astronomy, astrophysics, glaciology and atmospheric research. The station is operated and occupied year round.

The station consists of three main structures interconnected by above grade, hinged, enclosed passageways. Two identical raised polygonal buildings are divided for quiet and loud activities, respectively. The "calm" building houses laboratories, lodging, communications, and medical facilities, while the "noisy" building houses the kitchen, dining area, and some storage and technical plants. Up to 36 personnel can be housed in the main station buildings. The third main structure, made up of stacked and adjacent interlocked shipping containers, houses power and mechanical facilities. Workshops, fuel storage tanks, waste management containers and science support structures scatter the area surrounding the main station with some science facilities located up to 0.62 miles (one kilometer) away.

A self-sustainable summer camp with capacity to hold 46 persons and with water, power, and heat, houses the summer overflow population. This camp also serves as



A Bulldozer Delivering Snow to the Power Plant

the emergency shelter for the station in the event of a catastrophe to the main facilities.

According to station management, there are plans to upgrade the external laboratories, which are currently housed in containers, renovate the summer camp and make improvements to the garage. EIAs will be conducted as appropriate.

PERSONNEL

At the time of the inspection, there were 46 staff members on station: 22 scientific staff and 24 logistical/support staff. The station has a capacity of 82 beds, but the maximum population in the 2011/2012 season was 75. The summer station leader is always Italian, while the technical manager is always French and the winter station leader usually rotates between Italy and France each year.

Ten to fourteen staff members form the over-winter crew. Historically, Concordia has had no military station team members. All station staff members receive medical screening in France or Italy (depending on nationality) prior to deployment.

IPEV and PNRA provide training in advance of deployment in their respective countries. Italy's two-week training program focuses on search and rescue,

first aid, fire fighting, environmental practices and survival. The lecture material is given in electronic format to every participant. France provides hands on training for summer staff and written guidance to all its personnel. The written guidance covers the Antarctic Treaty and Environmental Protocol, living conditions, medical information, communications and other guidance for nationals living outside of France. In addition, a meeting is organized for all the winter-over members, French and Italian, in order to provide the same information to the staff. Managers from PNRA and IPEV make the presentations on the two organizations, life at Concordia, medical issues, and the Antarctic Treaty and Environmental Protocol.

Concordia has a fully equipped medical facility, including an operating room, dental suite, and one dedicated sick room bed. The facility also has an ultrasound, x-ray and electrocardiography (EKG) equipment. During the summer season, Concordia hosts two physicians – one research and one clinical – as well as one nurse/anesthesiologist. During the winter, there are two clinical doctors on station, and four other staff members are trained on site to provide assistance to the doctors.

The fact that Concordia Station is jointly operated and managed by Italy and France was of particular interest to the observer team. Such international cooperation

can set precedents for future Antarctic collaborations by many countries.

The two countries manage their cooperation via a Collaborative Agreement signed in 1993 by the directors of the two national programs and an intergovernmental agreement signed by the two countries' Ministers of Research. The Collaborative Agreement establishes a steering committee of six members led by the directors of the programs. The station leaders informed us that, as a practical matter, the Steering Committee has few formal meetings (which include meeting before the start of the season, and planning for science to be undertaken and logistics requirements). When important issues arise with respect to station management, station leaders routinely seek guidance from the two program directors, who consult and then make a decision by consensus. The program leaders do not rely on particular decision-making procedures, but are able to reach agreement efficiently as they know each other well.

The description of decision-making from the station leaders indicated that the station benefited from a clear cooperative attitude between the French and Italian governments, and the national program leaders in particular. The team wondered whether it would be helpful for the two governments to establish further procedures for the Steering Committee or beyond those provided in the Collaborative Agreement, in case of need in the future.

The team recognized that there are a number of positive factors that follow from more than one country jointly operating an Antarctic station. These include cost-effectiveness and budget-savings in running the station, better opportunities for organizing integrated and complex scientific research, and application of the best available technologies and practices.

Nevertheless a number of difficulties can and do arise as a result of having dual administrative control of the operational regime of the station. It was reported that the French personnel at the station (as well as those foreigners who work there under the auspices of the French program) are to abide by French rules and the Italians by Italian rules. This may create a situation of legal ambiguity, as persons working together are subject to different legal regimes. Moreover during the visit to Mario Zucchelli Station the observers learned

that Italy in fact has no legislation implementing Madrid Protocol provisions. Therefore it is hard to define what environmental protection regime applies to the activities engaged in by the Italians, how they would resolve important issues such as liability in case of environmental damage, etc. (Further information on this topic is provided in the section on Mario Zucchelli Station.)

Another noticeable aspect relates to inequality with respect to salaries and insurance/benefits programs of French and Italian personnel, respectively, despite the fact that personnel of both nationalities share the same working environment and perform the same or similar functions. The team thought this was an issue that should be considered by any party contemplating bilateral or multilateral cooperation.

SCIENTIFIC RESEARCH

The construction and exploitation of stations located in the interior of Antarctica is a real challenge for national Antarctic programs since only those with significant scientific and logistical capabilities can accomplish such tasks. At the moment, only six countries have such stations (China, France, Italy, Japan, Russia and the United States). Concordia Station is one of the outstanding examples in this field. Built in 1997 primarily for the purposes of the European Project on Ice Coring in Antarctica (EPICA), this station is now shifting its scientific interests to astronomy, astrophysics and atmospheric sciences. This station is located on the Antarctic plateau where high level of transparency of the atmosphere and long periods without clouds make it one of the best places on Earth for astronomical research.

French and Italian Antarctic programs also conduct at Concordia geophysical (seismology and geomagnetics), microbiological and medical (physiology of human body in extreme conditions) research.

The station hosts a number of international scientific research programs with participation of the researchers from mostly European countries such as Denmark, Belgium and the United Kingdom. The observers were informed that such projects are carried out under the auspices of either the French or Italian Antarctic programs.

There are no field camps supported out of Concordia, although within 0.62 miles (1 km) from the station there is a summer camp that serves as a safety camp in winter, and, if necessary, there are summer science traverses to perform glaciological studies. On the day of the inspection one such traverse returned to Concordia from Vostok station (Russia) having drilled a 100-meter borehole in snow-firm cover.

The team paid special attention to the situation involving the deep ice borehole at Concordia drilled under the EPICA project, where liquid consisting of kerosene (jet) and freon (F141B) was used to conserve the hole. According to the information available, this liquid appeared to be similar to the one used at the Vostok Station drilling project where ecological effects of the liquid had been a matter of thorough consideration at a number of the Committee for Environmental Protection (CEP) meetings. It was noted that after completion of the EPICA project France and Italy conducted random monitoring of the borehole (as reported to the observers, most recently in the 2010-2011 season).

Meanwhile, the presence of hazardous liquid in the conserved borehole is significant and requires monitoring. The team learned that an unexplained and un-investigated drop of liquid level has in the recent past been suspected in the borehole. It is reasonable to assume this fluid migrated into the surrounding snow/ice which would be considered a permanent release. Although French authorities subsequently informed the team that several measurement efforts indicate that the level of drilling fluid remains the same as after the completion of the drilling activity, a management plan for the borehole may be warranted to address environmental responsibilities. Having considered this, it may be desirable, in order to dispel any concerns of the international community on this account, for an additional EIA to be conducted if the borehole is to be kept this way (and in this case provide for regular monitoring of the borehole). However, if the borehole is to be closed, relevant information could be presented to the CEP meeting in respect of the extraction of fluids, clean-up, etc. and corresponding contingency plan.

TOURIST AND NGO ACTIVITIES

It was not surprising to learn that there are no tour operators arranging visits to Concordia, given the sta-

tion's remote location. Team leaders noted that it was the station's policy not to encourage non-governmental visits. However, we were informed that a recent visit of private individuals did occur at the invitation of the French Foreign Ministry.

LOGISTICS AND OPERATIONS

COMMUNICATION

Links include VHF and HF radio, Iridium satellite phone with voice and text capability, as well as satellite voice and data links with Internet, voice (VoIP), data and email capabilities. The station has a small computer lounge, VSAT for telephone, fax and Internet, as well as VoIP conferencing room and medical teleconference capabilities.

TRANSPORT

Logistical support of Concordia is performed only in the summer season (end of November – beginning of February). Due to harsh weather conditions (temperatures below minus 58 degrees Fahrenheit/minus 50 degrees Celsius) for more than nine months per year, the station functions fully autonomously and has access to the outside world only through communication systems.

Italy's PNRA provides the air support from Italy's Mario Zucchelli Station, and occasionally from Dumont d'Urville, as needed, in the form of Twin Otter and/or Basler aircraft. A private, third party contractor (Kenn Borek Air, Ltd.) provides this air support.

France's IPEV provides cargo support via three traverse resupply convoys of 8-10 tractors. The cargo is delivered via ship to Dumont d'Urville and transferred to Cap Prud'homme, which serves as the continental launching point for inland traverses. A typical convoy consists of two or three snow grading machines leading six to seven tractors towing the cargo sledges. Approximately 150 tons of cargo is brought on each traverse, two thirds of which is fuel.

There are many different types of vehicles at Concordia, including tractors, loaders, cranes, snowmobiles, snow cats and pickup trucks.



Open Exterior Windows at Concordia Station

The logistical support of Concordia presents a real challenge since it is based on complicated management scheme. Nonetheless this system appears to work well, and there have not been any major perturbations reported.

FUEL STORAGE AND USE

The station utilizes diesel fuel for power generation, as well as kerosene, petrol and other fuels as required for vehicles. Concordia's fuel arrives by tractor traverse from Dumont d'Urville and is stored in bulk in tanks inside specially constructed shipping containers that have sealed tubs for their lower third. A spatially removed supply of fuel is present at the summer/emergency camp.

In addition to detailed written fuel transfer guidelines, station personnel responsible for fuel management receive specialized training for handling hazardous materials and for spill prevention and clean up.

POWER GENERATION AND MANAGEMENT

The station was designed for power production and fuel consumption efficiency. Maximum consumption in the summer season averages 150 kilowatts. The

station has two diesel generators capable of generating 110 kW each and a third that generates 193 kW.

Waste heat from power generation is effectively used to heat the station year round. The station's insulation and ventilation systems, however, are so robust that during the summer, station personnel open many of the external windows to modulate heat. At the time of the inspection, the team was struck by how many windows at the facility were kept open despite the fact that the outside temperature was below minus 20 degrees Fahrenheit (minus 30 degrees Celsius), and what this implied for the station's energy efficiency. Station management explained that Concordia is planning to test solar panels at the summer camp in the coming season and exploring other possibilities for renewable energy use. If successful, solar generation of electricity will reduce traditional power generation and its associated waste heat and thus likely decrease the need to open windows in the summer.

WATER SYSTEMS

Fresh water is obtained by melting snow, which is heated by the jacket water circuit. The snow is collected from a designated collection zone and delivered to the power plant by bulldozer. The extensive gray



Concordia Station Operations Center

water recycling system (see following section on waste management) reduces fresh water consumption levels.

MANAGEMENT OF DANGEROUS ELEMENTS

The station stocks and utilizes a limited amount of chemicals. Chemicals appear to be properly managed, stored and handled in the laboratory areas of the Station. Concordia's waste and recycling facilities are properly marked and segregated for hazardous materials.

Station personnel reported that no weapons, radioisotopes or explosives are present on station.

EMERGENCY RESPONSE CAPABILITY

The work of Concordia personnel in isolated winter conditions require utmost reliability on the station's life-support systems, with a special emphasis on responding to fire risks, technical failures and other life-threatening incidents at those periods when external assistance cannot be rendered due to weather conditions. European Space Agency (ESA) involvement in designing the station led to the use of several unique

space technologies and engineering solutions.

Like other stations in the interior of Antarctica (as in outer space), Concordia is faced with the possibility that receiving emergency assistance can be difficult or impossible. In these circumstances, having all of Concordia's living facilities under one roof increases the risk of casualties in the event of an emergency situation. Concordia does maintain a "safety camp" in winter (during the summer this camp supports the population that cannot fit in the elevated station) which is stocked with food, clothing, heaters, small generators and other necessary supplies. Nevertheless, Concordia management acknowledges that personnel would be in "survival mode" until rescued.

ENVIRONMENTAL PROTOCOL

As discussed in the chapter on the team's visit to Mario Zucchelli Station, it appears that Italy does not have in place laws and regulations needed to fully implement the Environmental Protocol. Because French law governs French science activities at Concordia, and Italian law governs Italian science activities, there could be inconsistency in implementation of environmental rules at the station depending on which nationality is conducting the activity. This situation could be particularly confusing in the event of application

of environmental rules to non-Italian or non-French nationals participating in station activities, or future science activities under auspices of other countries.

ENVIRONMENTAL IMPACT ASSESSMENT

The observers were informed that the station's "older" buildings did not fall under EIA procedures, since they were erected before Madrid Protocol became effective, although a CEE was prepared for the construction of the permanent station. It is worth noting nevertheless that Italian and French teams independently prepare assessments for their respective projects and in case of joint projects the party that leads the project does the EIA.

It was reported that no EIA had been prepared for new laboratories and a garage that are under construction at the moment. The view was expressed that these facilities will be based on sledges (and will not include any water or toilet facilities) that prevent causing significant impact on the environment. Such an approach, however, poses some questions since any construction activity in such a remote and pristine area as Concordia Station's location might have a more than minor or transitory environmental impact.

CONSERVATION OF FLORA AND FAUNA

There is no known flora and fauna in the vicinity of the station.

WASTE MANAGEMENT

The inspection team was provided with several documents concerning waste management procedures at the base. Waste management plans are available at www.ats.aq from both Italian and French parties.

Wastes are classified according to the European Union waste directive and separated into the following categories: glass, paper, plastics, PET (polyethylene terephthalate), aluminum, organic waste and mixed waste. Separated waste is transported to Dumont d'Urville via traverse and then shipped to Australia or to France. IPEV, through an agent, obtains an import permit from the Australian government for disposal of some of Concordia's waste in Australia.

Incineration is not used, except for small backup "incinolet" toilets that separately process urine and feces.

Wastewater is separated in two different systems: the grey water system and the black water system. Concordia operates modern plants designed together with the European Space Agency to treat grey water, converting it to potable water (although it is not consumed but only used for personal hygiene applications). A four-step treatment process including ultrafiltration, nanofiltration and two stages of reverse osmosis is realized. Treated water from the black water system is taken up by the grey water treatment unit and recycled. Solid waste from the black water system is containerized and removed from the continent as hazardous waste.

AREA MANAGEMENT

There are no ASPAs, ASMAs, or Historic Sites or Monuments (HSMs) around Concordia station. However, the station has established a marked clean area free of human interference.

MILITARY SUPPORT ACTIVITIES

None of Concordia's logistical or scientific support comes from military sources or staff. Military support to Concordia Station occurs only in the logistics occurring away from the station at Dumont D'Urville, Cap Prud'homme and Mario Zucchelli. There, military cargo handlers and mechanics are part of the team. No military personnel were reported at Concordia Station proper.



Mario Zucchelli Station Main Building

ITALY – MARIO ZUCCHELLI
74° 41' 42" S, 164° 07' 23" E
JANUARY 26, 2012

Mario Zucchelli Station (MZS) was established at Terra Nova Bay in the 1986/87 season by the National Program of Research in Antarctica (PNRA), which continues to operate the station today. The PNRA is funded by the Ministry of Education, Research and Universities. The station's logistical operations are managed by the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), which depends upon the Ministry of Economic Development. The National Research Council (CNR), which depends upon the Ministry of Education, Research and Universities, oversees the scientific programs. Mario Zucchelli is the only solely Italian station on the continent, although it provides significant logistical (primarily air) support for Concordia Station, which is jointly operated by France and Italy. The 2011/12 season is the 27th Italian Expedition to Terra Nova Bay. MZS continues to be well suited for the wide range of scientific research conducted there. MZS is a summer-only station.

The inspection team arrived at Mario Zucchelli at 12:45 p.m. on January 26. Expedition Leader Franco Ricci and the Station's senior management welcomed the inspection team, led a discussion of station orga-

nization and procedures, and provided a tour of the station's internal and external features. The inspection team provided four days' advance notice to the station.

PHYSICAL DESCRIPTION

The station is constructed on a large granitic outcrop on the coast of Terra Nova Bay in the Ross Sea region. It consists of a single, elevated T-shaped main building constructed of 110 modular containers. Given the seaside location, in some seasons the staff must repair water and/or ice damage that occurred over the winter.

Adjacent to the main facility, there are two large workshops and storehouses. Other outbuildings host physical plants, wastewater treatment and three wooden single-story bungalows that house recreational facilities, overflow and transient personnel (e.g., pilots) and emergency berthing.

The station has a multi-position helipad. It also has a reinforced concrete pier, constructed in the 2007/08 season, used in particular for supporting tender vessels to achieve loading and unloading operations from the Italian research and resupply vessel M/V ITALICA as well as launch and retrieval of a small research tender (SKUA). At this time, there are no plans for expansion of the station, although there is some consideration

being given to the future development of wind or solar power generation.

Mario Zucchelli Station has also recently developed an ice runway for wheeled aircraft on a nearby glacier, for which an IEE was conducted in 2007. This facility is only used when the annual sea ice in front of the station deteriorates too much to support air operations. The glacial ice runway is remote enough to require helicopter transport between the runway and station.

PERSONNEL

At the time of the inspection, there were 83 staff members on station. Of these, there were 28 scientists (including 7 from Korea and 2 from New Zealand), 51 were logistical support staff, and four guests, including two personnel from Concordia who were transiting off continent for the season. The ratio of logistical to scientific personnel was roughly 65 to 35 percent respectively at the time of the inspection.

MZS can house a maximum population of 100 persons. Although the facility has the potential to serve as a year-round facility, at this time Italy has no plans to do so.

All station staff and visiting scientists attend a two-week pre-deployment training program in Italy. This training includes familiarization with the Antarctic Treaty and Environmental Protocol, environmental management practices, first aid, fire fighting, communications and safety practices. In addition, written material and procedures are given to participants and available online.

All staff members receive pre-deployment medical screening. The station also has a medical center staffed by two doctors and one nurse for the majority of the season. The clinic is equipped for surgery, anesthesia and x-rays. Staff members needing more advanced care are assisted at McMurdo Station or are moved through McMurdo to New Zealand for treatment.

SCIENTIFIC RESEARCH

The construction of Mario Zucchelli began in the late 1980s as the principal location in Antarctica for scientific research by the Italian Antarctic program. It

has been a summer station, and we were informed that with the establishment of Concordia, it was agreed that Concordia would have preference for winter season Italian Antarctic research, and thus MZS remains open only during the summer.

The main directions of scientific research at the station are the following:

- geological research, history of formation of the Victoria Land and stratigraphy of sedimentary rock of Ross Sea within the framework of international program ANDRILL;
- biodiversity research on the evolution and the adaptability to the extreme Antarctic conditions of living organisms of different marine and terrestrial kinds of flora and fauna. Marine biological research is conducted both from aboard the ship and in the coastal areas of the Terra Nova Bay (also with the use of scuba technology);
- monitoring of chemical parameters of the environment;
- physical oceanography of the Ross Sea; and
- change of parameters of the environment.

Scientific research is conducted at a high professional level with the use of modern equipment and technologies. MZS conducts meteorological surveys for the Terra Nova Bay and Dome C regions, including current data and forecasting using satellite technologies and mathematical modeling. There were no field camps operated in the 2011/12 season.

International cooperation is widely used in scientific research at the station. MZS currently cooperates with the United States, France and the Republic of Korea. In the previous years there was collaboration with Germany, the United Kingdom and New Zealand. The Italian Antarctic Program has an agreement on joint scientific research and logistical support with the Korean Polar Institute. For the most part, this agreement is connected with the plans of South Korea to build a year-round station on the coast of the Terra Nova Bay in 2012-13.

Oceanographic research is conducted from M/V ITALICA.

TOURIST AND NGO ACTIVITIES

Station leaders reported that there was no tourist or NGO activity at the station in this season. Indeed, there have been no visits for the last two years. It had been noted that when such visits occurred (usually on board of the chartered icebreaker M/V KAPITAN KHLEBNIKOV), there were strict rules for the tourists: they were not allowed on the premises of the station, except for restrooms and coffee, tourists disembarked in groups not exceeding five, and visits were permitted only on Sundays or Saturday afternoons so that they did not interfere with the scientific work of the personnel. Station personnel reported that a single adventure tourist approached the station approximately 6 years ago, but had only minimal interaction with the station.

LOGISTICS AND OPERATIONS

COMMUNICATIONS

The station's communication links include VHF and HF radio, Iridium, Inmarsat satellite phone with voice and text capability. Voice and data links to the rest of the world are limited, provided through burst transmission over Inmarsat.

TRANSPORT

M/V ITALICA delivers supplies to the station and provides the majority of the station's logistical support, in accordance with the budget and the type of scientific research approved. As necessary and based on each season's operations plan, the vessel may come to the station several times during one season. The ship anchors in the bay, then barges move cargo to the pier where it is offloaded by crane. The station has fuel reservoirs that allow for three years' autonomy without resupply. M/V ITALICA then conducts several weeks of scientific operations in the Ross Sea before returning to the station to pick up material leaving Antarctica at the end of season (e.g., scientific samples and equipment; trash).

The personnel of the station primarily utilize USAP aviation support for transfer from Christchurch to

McMurdo and back. Further transfer from McMurdo to Mario Zucchelli is done via Italian contracted Twin Otter planes or DC 3 BT 67 Turbo Basler supplied by contractor (Kenn Borek Air, Ltd), and helicopters supplied by Helicopters New Zealand. Near the station there is a sea ice runway that is prepared every year for wheeled aircraft but that must be abandoned in early-to mid-December when sea ice integrity diminishes naturally. Flight control, meteorological and communication support are provided within the joint program of traffic control services from McMurdo and Mario Zucchelli Stations.

There were a large number and variety of vehicles at the station. These included trucks, fire trucks, ambulances, loaders, excavators, forklifts, tankers, snow cats, snowmobiles, bulldozers, etc.

The station has one motor tender SKUA for conducting oceanographic experiments, and multiple small rigid and rubber boats. A second motor tender was in Italy for repairs, while a third tender from M/V ITALICA was also on station.

FUEL STORAGE AND USE

Zucchelli has three large double-walled steel fuel storage tanks and several smaller tanks for equipment refueling. Fuel – including gasoline – is transferred from the ITALICA to the large tanks and by truck to the smaller tanks. The station also has a fuel distribution unit (station) to refuel vehicles.

POWER GENERATION AND MANAGEMENT

MZS has two diesel generators that produce 300 kW each, as well as two smaller emergency generators. Waste heat from both jacket cooling water and exhaust gasses is recovered and used to heat the interior of the station and to preheat sea water ahead of the desalination plant.

WATER SYSTEMS

Fresh water is produced by a reverse osmosis desalination unit which utilizes seawater collected via an external pump station. High pressure pumps driving salt water through ceramic membranes produce desalinated water that is treated with a UV disinfection system



Aerial View of Mario Zucchelli Station

prior to being distributed to the station. A direct salt water feeder supplies the station's internal aquariums.

MANAGEMENT OF DANGEROUS ELEMENTS

The station stocks and utilizes many chemicals used for marine research and for monitoring the station's environmental impact (e.g., discharge water quality). Chemicals appear to be properly managed, stored and handled in the laboratory areas of the station.

Station staff indicated that there were no firearms present at the station. Though the documents provided at the station indicated that there were scientific experiments requiring detonation of explosives for geology and geophysics experiments, when queried, station staff stated that there were no explosives on site currently.

Also, the written information provided indicated the presence of radioisotopes for biology and oceanography experiments, although staff stated that none are currently present. Italy subsequently clarified that on-station documents are general and did not reflect the fact that this year's research projects did not involve any explosives or radionuclide to be present on station.

EMERGENCY RESPONSE CAPABILITY

Persons deploying to MZS complete a rigorous two-week training period before leaving Italy. One week is dedicated to "theory" focusing on survival, medical, environmental, and safety issues (e.g., fire fighting and first aid). A full week is spent in a snow/cold outdoor setting practicing safe and productive operations.

The station practices every-other-week fire drills and performs simulation emergency exercises. The separated structures (bungalows) present at the site provide an emergency shelter that is likely adequate for the summer period (which is the only time the station is occupied).

ENVIRONMENTAL PROTOCOL

Station managers informed us that Italy lacks legislation needed to implement the Environmental Protocol and thus Italian agencies would have no ability under law to enforce Antarctic Treaty rules with respect to Italian citizens or those participating in activities at the station. The team viewed this as a significant problem. While it is true that the station would have some ability to address failure to follow environmental rules, (e.g., by taking administrative action, such as terminating a

contract or denying future access to the Italian Antarctic program) the inability of the Government of Italy to prosecute persons for failure to adhere to environmental rules could be an impediment to effective enforcement. This situation is particularly troublesome given the prominence of Italy in Antarctic affairs, clearly demonstrated by the major activities underway at Mario Zucchelli and Concordia. However, team leaders emphasized that they were quite proactive with respect to implementing preventive measures to ensure compliance.

Upon reviewing the draft report, Italian officials informed the team that:

Italian law n. 54 of 1995 that allowed for the signature of the Madrid Protocol states, in Article 2, that, "the Madrid Protocol will be immediately put into execution". This means that, although the laws implementing the Protocol are still missing, the Protocol and its annexes are applied directly. The Ministry of Foreign Affairs and the Ministry of Environment are currently working on a satisfactory solution.

All of the participants in the Italian Antarctic Expedition are to respect the Italian laws and in particular the Italian environmental regulations that are more restrictive than the prescriptions of the Protocol, in particular for what concerns the quality of effluents and environmental damage. The expedition leader has, during the expedition, special powers that allow him to take measures if Italian laws are not followed. In effect, an accurate selection process and adequate training of the personnel on environmental issues have proved to be effective in ensuring compliance.

ENVIRONMENTAL IMPACT ASSESSMENT

The station conducts an ongoing air and water quality monitoring program, including of its incinerator, to ensure compliance with relevant Italian laws and regulations.

CONSERVATION OF FLORA AND FAUNA

Terra Nova Bay is home to a wide range of Antarctic flora and fauna, including marine life, lichen and mosses. All scientists must declare any activity involving flora and fauna prior to deployment and obtain a permit. Eight such permits were issued in the 2011/12 season. At the conclusion of this scientific activity, the Station's Environmental Officer must be informed of the actual (vice planned) outcome.

WASTE MANAGEMENT

Mario Zucchelli Station exhibits good waste management practices with respect to recycling. Separation of waste categories is well facilitated and understood. All but paper and organic wastes are removed from Antarctica.

A number of sensitive and hazardous waste types are consolidated in containers (some standard drums and others shipping containers) in an area separated from the station and not too distant from the shore. Given the proximity of a skua colony to the station, and the bold nature of this species of bird, station personnel indicate that all containers and containment devices are closed except when personnel are present and actively accessing waste materials.

The station includes a large, two-stage incinerator. Food, paper, cardboard and wastewater sludge are processed by this facility. To be efficient, the incinerator is operated in batch mode only when adequate stockpiles of waste have been accumulated. This results in the facility being turned on approximately once a month. Rigorous monitoring of gases and ash are practiced to ensure that combustion is complete and that solid by-products are inert.

A complex wastewater treatment system exists at the station. All wastewater is passed through a multi-phase treatment process resulting in the release of water with very low levels of organic and chemical content. All sludge and solids removed are incinerated. A vigorous monitoring program exists for wastewater, as does for incinerator byproducts.



Terra Nova Bay

AREA MANAGEMENT

There are several Antarctic Specially Protected Areas (ASPAs) in the vicinity of the Mario Zucchelli Station (one of them is the marine protected area – “Terra Nova Bay”). It was reported that the areas are not marked as the number of visitors is limited and station personnel are aware of these ASPAs. The team stresses the importance of marking and monitoring ASPAs wherever possible. The station leader stated that, in the case of scientific activities in the ASPAs, scientists obtain appropriate permits. Nonetheless, in the context of the aforementioned absence of relevant rules and regulations in the Italian legislation, this poses some grounds for concern.

Italian officials subsequently informed the team that:

Any proposed activity is subject to an environmental assessment prior to its approval. Only once approved can the activity proceed. The ASPA management plan is available on site and ASPA access to scientists is provided after training on the associated environmental issues.

MILITARY SUPPORT ACTIVITIES

Eleven of 83 people on station at the time of our visit were military personnel. These included one of the station doctors, personnel to support boat operations and flight operations (air traffic control and meteorology), divers and mountain guides.

APPENDIX:

LIST OF ACRONYMS

ANDRILL	Antarctic Geological Drilling
AHT	Antarctic Heritage Trust
ASMA	Antarctic Specially Managed Area
ASPA	Antarctic Specially Protected Area
ATCM	Antarctic Treaty Consultative Meeting
CEE	Comprehensive Environmental Evaluation
CEP	Committee for Environmental Protection
EIA	Environmental Impact Assessment
ENEA	National Agency for New Technologies, Energy and Sustainable Economic Development (Italy)
EPICA	European Project on Ice Coring in Antarctica
HSM	Historic Sites and Monuments
IEE	Initial Environmental Evaluation
IPEV	French Polar Institute Paul Emile Victor
MZS	Mario Zucchelli Station
NSF	National Science Foundation
PNRA	National Program of Research in Antarctica (Italy)
RNZAF	Royal New Zealand Air Force
SAR	Search and Rescue
USAP	United States Antarctic Program

The motor tender SKUA at Zucchelli Station



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