

Diary of Events, Highlights of Achievements and Technical Report of the 24th Indian Antarctic Expedition

Rajesh Asthana

Expedition Leader and Station Commander

Chronology of Important Events

- The team members assembled at Mahasagar Bhavan, New Delhi on August 23, 2004 and medical examination followed by Snow and Ice Acclimatization training at ITBP, Auli commenced with effect from August 30, 2004.
- The Team assembled at NCAOR, Goa on December 05, 2004 for briefing and fire-fighting training. **Shri Mirza Javed Beg** was declared as **Deputy Expedition Leader** and **Leader of Task Force Team** at Larsemann Hills comprising a group of four other scientists, Dr. Mihir K Dash, NCAOR representative, Dr. Jaswant Singh, Dr. Ram Manohar Lohia Avadh University, Dr. Ashwani Wanganeo, Barakatulla University, and Shri M. Shrivastava, Indian Coast Guards.
- All the team members departed from Goa on December 09, 2004 for Mumbai from where onward journey to Cape Town via Johannesburg was performed on 10th December. Members boarded the expedition vessel, Mv. Emerald Sea on 10th December 2004. 3 Malaysian scientists joined the Indian team on 11th December 2004 and the expedition was formally and ceremonially flagged off at Cape Town on 12th December, 2004.
- The Expedition vessel Mv Emerald Sea had crossed 40 degrees south on December 20, 2004 at 0125 UTC and the Antarctic Circle was crossed on December 27, 2004 at 0600 UTC.
- After encountering the fast ice close to India bay and a temporary halt on 27th December, courtesy sortie to Maitri was made on 28th December, 2004.

- The induction of all summer scientists with their equipments and essential expedition cargo was completed by 29th December, 2004. The charge of the Indian Scientific Base MAITRI in Antarctica was assumed on Saturday, the 15th January 2005. The Station Commander of the 23rd Expedition, Mr. S. Jayaram along with entire team members moved to the expedition vessel Mv. Emerald Sea.
- 11 members 21st CHINARE team along with the Voyage Leader, Dr. Zhang Zanhai paid a visit to Maitri station.
- A High Power Indian delegation led by Mr. Kapil Sibal, Hon'ble Minister of Science and Technology and Ocean Development (Independent Charge) visited Maitri and expedition vessel, Mv Emerald Sea with effect from February 02, 2005 to February 04, 2005. The eight member Indian delegation besides Hon'ble Mr. Sibal included Dr. Harsh K. Gupta, Secretary, Department of Ocean Development, Shri A.K. Rath, Additional Secretary & Financial Advisor, D.O.D., Dr. S.P. Seth, Joint Secretary, D.O.D., Dr. P.C. Pandey, Director, NCAOR, Shri Avinash Dixit, PS to Minister of State (IC) for S & T and D.O.D., Shri Mugesh, K., Cameraman, Doordarshan, and Shri Sujan Veniyor, Production Executive, Doordarshan.
- Valedictory function and de-induction of the Summer Team on February 28, 2005.
- Convoy route was surveyed and the first joint convoy along with the logistic team members commenced from Maitri on March 11, 2005.
- Expedition vessel Mv. Emerald Sea sailed off at 1330 UTC on March 13, 2005 after successful and safe completion of discharge of all the expedition cargo and support to the station.
- Successful return of the first convoy after completion of work on the shelf carrying fresh supply of provisions and required fuel was accomplished by winter team members on 15th March, 2005. Subsequently three more convoys were planned to bring all the essential supplies of expedition cargo before embarking upon a planned recovery of tanker and trailer that was frozen deep into a lake since 19th expedition.
- Publication of an in-house monthly magazine "Maitri Varta" started on 6th April, 2005 on a regular basis with Dr. Gautam Bandyopadhyay

as Editor-in-Chief and contributions from almost each member that provided a healthy time-pass and very good recreational reading material throughout the tenure of the expedition.

- An eight member team started recovery operation under the guidance of Maj. Rajender Sial which finally succeeded in the retrieval of tanker and trailer entombed in frozen lake enroute India Bay in the shelf region on 29th April, 2005. This Herculean task was indeed a commendable job requiring tremendous will power, courage, physical and mental endurance that boosted the morale of entire team and received admiration from all concerned with Indian Antarctic Programme and NCAOR.
- With the onset of Polar nights from 20th May, 2005 a series of winter sport events were organised involving each members at Maitri. Mid-Winter Day was celebrated at Maitri and neighbouring station “Novo” on 21st and 22nd June respectively along with lots of cultural celebrations and gaiety.
- Flag hoisting and celebrations were organised on the occasion of Independence Day followed by distribution of the prizes and certificates to the winners of winter sport competitions.
- “EME Day” was celebrated with an erection of monument of abandoned “Snow Cats” and excursion to the Dakshin Gangotri (DG) Snout.
- The fifth convoy started from Maitri for the shelf after the Polar Nights on 22nd October, 2005. The last convoy, sixth one, concluded entire logistic operation related to shifting of expedition cargo from Shelf to Maitri and back loading materials to Shelf on 14th November, 2005.
- The new team, XXV ISEA, led by Shri L.Prem Kishore onboard Mv. Paardeburg arrived on 10th January, 2006. Induction of the new team members started immediately as per requirement and planned activities. After imparting training and proper handing over-taking over, Maitri station was finally handed over to the Leader & Station Commander of XXV ISEA, Shri L. Prem Kishore on 21st February, 2006.
- Mv. Paardeberg was brought alongside the shelf at India Bay on 20 Feb 2006. The fuel decanting operation was completed on 23 Feb 2006 and a total of 262 KL of fuel was pumped out of the ship and

put into the storage tankers lined up on the ice-shelf. The joint convoy was under taken on 24 Feb 06 which reached shelf at 2300hrs on the same day. A total of eight Pisten Bulley vehicles along with Trailers and mobile accommodation unit, Banjara, were used in the first convoy.

- The unloading operations were completed on 26th February, 2006 but the return voyage could only be started on 3rd March, 2006 and the team reached Cape Town on 12th March, 2006.



Fig. 1 : The launching of XXIV ISEA from NCAOR, Goa on 5th December, 2004



Fig. 2 : Mr. Kapil Sibal, Hon'ble Minister of Science and Technology and Ocean Development (Independent Charge) visiting Maitri Station



Fig. 3 : The GSI team at the mid-way fuel dump on the way to Muhlighoffmann mountains

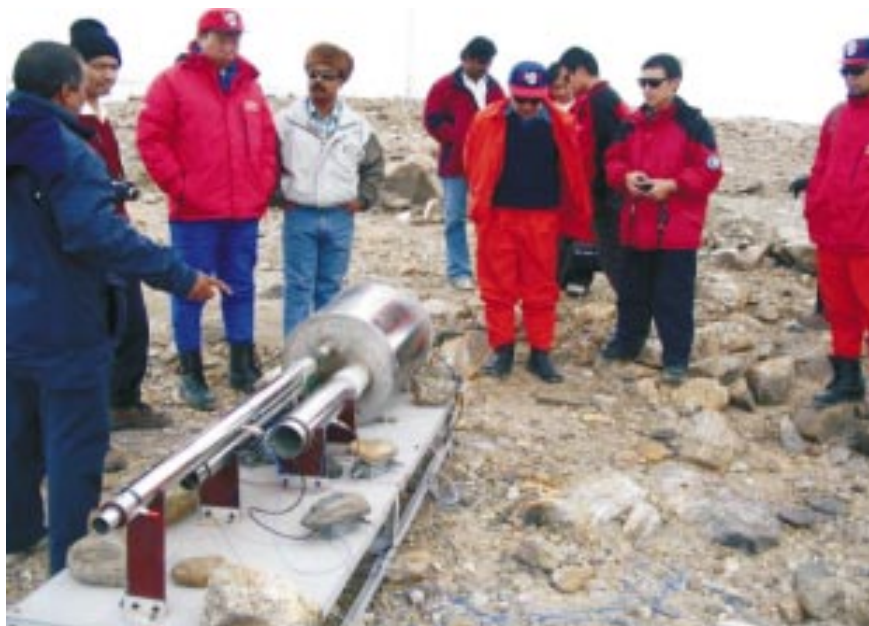


Fig. 4 : 21st CHINARE team along with the Voyage Leader, Dr. Zhang Zanhai on a visit to Maitri

THE SCIENTIFIC PROGRAMMES

The approved scientific objectives of various participating organizations, namely, the Geological Survey of India, Indian Institute of Geomagnetism, India Meteorological Department, Barakatulla University, Department of Physics and Department of Limnology, National Geophysical Research Institute, Indian Institute of Tropical Meteorology, National Physical Laboratory, National Centre for Antarctic and Ocean Research, National Hydrographic Office, Zoological Survey of India, Dr. Ram Manohar Lohia Avadh University, Defence Institute of Physiology and Allied Sciences, Defence Electronics Applications Laboratory and Survey of India were undertaken during austral summer and winter periods. 3 scientists from Malaysia under an International co-operation programme between the National Centre of Antarctic and Ocean Research and Malaysian Antarctic Programme from School of Science and Technology and Biotechnology Research Institute, Universiti Malaysia Sabah and Institute of Biological Sciences, Faculty of Science, University of Malaya also carried out their scientific research.

Geological Survey of India besides carrying out regular and ongoing glaciological programmes, Geological mapping was successfully done in the western part of Muhlig Hofmannfjella, between 71.86° S and 72.13° S latitudes and 4.43° E and 4.97° E by helicopter support and creating a mid-way fuel dump for refuelling helicopters to meet the fuel requirement as the area was much beyond the flying endurance. Lake bottom sediment coring was done during wintering period.

Indian Institute of Geomagnetism carried out the study of global electric circuit for understanding solar-terrestrial relationship and associated changes in surface weather with solar output. Continuous measurements of atmospheric electrical parameters, namely, the air-earth current, the surface vertical electric field and the electrical conductivity were monitored aiming towards understanding the near earth electrical environment. GPS studies were also carried out involving establishment of semi permanent stations in Schirmacher Oasis on rocky outcrops to measure the crustal displacement and strain field and monitoring of the glacier movements, South of Schirmacher Oasis for studying ice-shelf dynamics.

Continuation of ongoing programme at Maitri including synoptic observations of weather parameters, recording of surface ozone and its vertical distribution through ozonesonde ascents, radiation budget studies,

turbidity measurement for aerosol, reception of satellite cloud imageries and recording of snow fall were conducted by India Meteorological Department. Brewer Spectrophotometer was also utilized for the measurement of ozone concentration in the atmosphere at Antarctica.

Barakatulla University, Department of Physics had projects of VLF propagation studies and the Department of Limnology had project of studying nutrient dynamics and primary production involving freshwater bodies to understand the behavioural mechanism of plankton population.

National Geophysical Research Institute had established a digital broad band Seismological Observatory at Maitri to study the seismotectonics and the geodynamical processes by recording seismic activities in and around Antarctica. The MTS group carried out Magnetotelluric field investigations to study the deep electrical structure and related geodynamical processes by recording natural electromagnetic signals.

Indian Institute of Tropical Meteorology conducted measurements of atmospheric small, intermediate and large ions, concentrations and size distribution of atmospheric aerosols; data collection on atmospheric electric field, conductivity and Maxwell current. Studies were also carried out to characterize Antarctic aerosols and precursor in terms of their optical, physic-chemical and radiative properties; estimation of direct radiative forcing due to aerosols under different meteorological conditions and comparisons of measured parameters with in-situ and satellite products.

National Physical Laboratory had projects to systematically measure PBL processes and their dynamics in a complex Antarctic environment in relation to the marine aerosols utilizing Aerosol size sampler, Acoustic sounder, Ocean probe measurements of oceanic parameters, AWS, UV-B Spectrophotometer & Sun Photometer, High Volume Sampler and Respirable Dust Sampler and UV – B Biometer.

NCAOR had a project along with Indian Coast Guard to collect lake sediment samples with a view of using multi-proxy data including diatoms, pollens-spores, silicoflagellates, sediment texture and mineralogy to decipher climate change through the geologic past.

Antarctic region is one of the most inadequately surveyed regions, hence National Hydrographic Office had a mandate to prepare a nautical chart of the sector of Indian activities involving bathymetric surveys, coastlining of the extent of ice shelf and collect physical oceanographic data.

Zoological Survey of India carried out studies on faunal diversity and ecology of moss-inhabiting terrestrial invertebrate fauna of Schirmacher Oasis besides monitoring of Avian elements.

Studies related to Human Physiology and Medicines including sleep disturbance / sleep pattern in relation to Melatonin hormone was carried out by DIPAS whereas DEAL provided and maintained the communication facilities and communication equipments at Maitri as well as onboard ship during the voyage and stay at Antarctica.

Significant Logistic Work besides Routine Assigned Tasks During the Expedition

The logistic members of XXIV Indian Scientific Expedition to Antarctic remained constructively engaged in maintaining the various life support systems like power generating units, station heating system, waste water disposal unit, water supply system, vehicle maintenance and conducting convoys etc., since the induction in December 2004 till completion of the expedition in March, 2006. Besides carrying out the routine maintenance tasks and supporting scientific component, they were motivated and assigned several innovative and requirement based tasks which will certainly help the future expeditions that brought about an aesthetic change in Maitri and its surroundings.

Major logistic accomplishments and expedition related achievements can be mentioned below:

Recovery of Fuel Tanker and Trailer: One of the biggest achievements during this expedition was the recovery of a fuel tanker and a trailer from the frozen lake in the shelf area, about 40 km north of Maitri. During the 19th Indian Antarctic expedition (1999-2000), one of the Pisten Bulley vehicle carrying a fuel tanker on a trailer got stuck up almost midway in an ephemeral lake enroute India Bay. Due to the overall weight of the fuel, tanker and the trailer, the top frozen surface of the lake collapsed and the trailer along with the tanker load got submerged into the lake. It was considered irretrievable due to obvious reasons of Antarctic harsh weather, inadequate machinery and manpower as well as will power and remained frozen till we considered to put an all out efforts for its retrieval.

The attempts of recovering these costly expedition equipments involved enormous amount of physical and mental exercise under stressful working conditions but sheer determination and team work resulted in the

success of seemingly impossible mission. The tanker along with its various components were cleared from three sides using digging manually, portable ice cutting electro-mechanical saw and by melting the ice through a careful and controlled heating by eight fuel burners used for incinerators. A trial was given to pull the tanker along with trailer using two Piston Bulleys with the help of steel wire after releasing it from three sides but the steel wires got snapped due to the resistance created by still frozen and unreleased



Fig. 5 : Photographs showing different views of tanker with trailer frozen in an ephemeral lake on the shelf

bottom portions. Then, the bottom portions were also cleared as far as possible from the accessible areas.

After releasing the equipments from maximum possible sides, two Piston Bulley vehicles were used to pull the trailer from the sides to put it back on both the tracks. After the trailer was brought down on both the tracks, the vehicles were repositioned to pull the trailer from the front. It took several attempts from various angles before the blue ice got cleared off and the trailer came out of the frozen lake. Once the trailer was out the fourth side of the fuel tanker was accessible. Once the ice was cleared from the fourth side, a side pull with the help of Piston Bulley vehicle over turned the tanker and pulled it out of the lake.

The Herculean efforts put in by the team members without caring for severe winds and extreme discomfort, brought glory and the tanker with trailer got salvaged preventing the loss of National property.



Fig. 6 : Various stages of attempt to release the tanker and trailer using electrical burners for melting surrounding ice



Fig. 7 : Successful recovery of the tanker along with trailer and the team members in ecstatic mood

Construction of an Extended Platform at the Western Entrance of Maitri Station

An open and purposeful platform adjacent to the Maitri lounge at the western entrance was constructed by cannibalising the relics of an IMD balloon launching pad, which otherwise was lying as scrap close to Priyadarshini lake. This platform adds to the beauty of the Maitri structure, apart from serving as an additional place of recreation as well as suitable place to unload the heli- borne under-slung cargo net carrying food and other provisions meant to stack in the station lofts or kitchen area.



Fig. 8 : The extended platform under construction and the finished look

Renovations in the Maitri Lounge

The Maitri lounge is located towards the left flank of 'B' block, which is a multi-utility area serving as dining hall cum recreational lounge and is the only place for every community activity / official meetings at Maitri. An LCD projector, brought along with 24 ISEA was mounted in the ceiling for projecting the movies. A screen was constructed using the ply board and sun mica. A redundant wooden support pillar was removed from the

centre of the lounge to increase the viewing area. Removal of pillar was re-strengthened by placing an iron beam along the existing pillars to support the roof.



Fig. 9 : View of Maitri lounge with the obstructing pillar, removal of the pillar and re-strengthening by iron beam

The work was accomplished with the help of carpentry and welding work. Also the roof was done up using the plaster of Paris and paint for aesthetic finish. The walls were repainted and some of the paintings were reframed. A wooden rack for music system, VCR and DVD player was also carpentered.



Fig. 10 : Maitri lounge after renovation

Fabrication of Sledge and Module for 'Jeevan Jyoti'

Jeevan Jyoti, the generator module, accompanies convoys for providing power supply to the living module. Existing module was too big for 30 KVA generator designed to occupy a full-length standard sledge used for transporting a 20 feet container. Thus, the large size sledge could not be double towed engaging a separate Pisten Bulley vehicle during every convoy. To optimize the use of vehicles, a new sledge was fabricated during the summer months by cannibalizing an old, unserviceable sledge. Using the skies and the tow-bar of an old sledge, a smaller size fabrication was made where an old, redundant, two men hut was placed for housing the 30 KVA generator. This newly fabricated sledge measures only 8 x 8 feet allowing it to be double towed along with any standard full size load.



Fig. 11 : Fabricated generator module and its double towing along with tanker load

It has stood the test of time and is at par with any of the standard sledges in performance. Lightweight, small sized and carefully designed innovative generator module suits the rugged Antarctic terrain and it has proved to be a big help in the establishment of field camps.

Modifications in Living Module ‘Banjara’

Banjara, the living module was designed to accommodate eight persons during the convoys. It has a small toilet and kitchenette to cater for basic needs during bad weather. The module was quite old and in dilapidated condition because of continuous usage over the years. Due to induction of new vehicles, the strength of convoy rose from seven to nine vehicles. Though, originally designed for eight persons, it was now supposed to cater for ten persons in each convoy.



Fig. 12 : The mobile living module ‘Banjara’

Keeping in mind the present requirement, extensive alterations involving carpentry, plumbing and electrical work was undertaken for Banjara. The old heating system and the water storage tanks which could never be used in Antarctic conditions were removed and replaced by cupboards and shelves to stock the rations and other basic amenities required during the outdoor activities during convoys. The kitchenette floor was changed and a new table was fabricated for gas range and microwave oven. Old furniture (Bunk beds, tables) was repositioned in order to accommodate two extra bunks. The new, refurbished Banjara offers sleeping space for ten persons, sufficient racks for personal belongings, sleeping bags, working-overalls, a T.V rack, sitting place for four with a small folding table. The reconditioning has increased its life at least by two years. Nevertheless, the need for a suitable replacement is as strong as ever. It has no doubt been revitalized, but the aging has not ceased.

Assembly of Field Camp Huts

Two fibre huts (one ten-men, Melon hut and one four-men Apple hut) of Australian make were brought to Antarctica in knock down state, from Cape Town in this expedition. During the voyage from Cape Town to Antarctica, both these huts were assembled as per the given specifications. Subsequently, these huts were transported to campsites using helicopter support.



Fig. 13 : Assembly of apple hut in the ship's hold

The Apple hut has been placed on the polar ice cap, south of Maitri and the Melon hut has been placed at Larsemann Hills, about 2800 km East of Maitri, as the first Indian structure marking the site for new station.

Relocation of Generator Complex

The main building of Maitri was constructed in 1986-87 and the A-block was initially designed to house the generators. Excessive vibrations,



Fig. 14 : Placement of 'Melon Hut' at Larsemann Hills as the first Indian structure

noise pollution, risk of fire since the beginning and with expansion of activities, more generators were necessitated, resulting in space constraint and thus need for a separate and a bigger generator complex. A new generator complex behind the main building was built during the X Expedition in 1990, which was gutted in fire the very next year during the XI Expedition. In the later expeditions the generators were removed from A-Block and moved into containerized modules positioned behind Maitri main building, at a distance of about 75m. Gradually, the number rose from two to ten. The ten generators at Maitri are housed in three different complexes, namely, Aditya, Surya and Bhaskara. Aditya and Surya complexes house four 70 KVA, air-cooled generators each and Bhaskara complex houses two 125 KVA water-cooled generators. The star-shaped layout of Aditya complex, favourably disposed with the wind direction, was found suitable, viz a vie, cooling, without much of snow ingress during blizzards. On the contrary, the other two complexes did not have the aforesaid advantage of neither the layout nor the wind direction.

Moreover they were located very close to Aditya complex and perpetually laced with problems of close proximity to each other (a big fire



Fig. 15 : Old layout of generator complex

hazard), heavy snow accumulation in front of the containers during the blizzards (necessitating snow clearance on a regular basis), accumulation of snow at the rear entrance of Maitri due to topographic hump between Maitri and the generator complex, inappropriate cooling of generators in Surya and Bhaskara complex due to improper layout, inconvenient access for galley persons due to uneven terrain with boulders all around.



Fig. 16 : The improper layout and bouldery terrain around the generator complex

Improper layout of the fuel pipeline and the electrical cables from the generator complex to the main building made it impossible to locate a fault or a leakage in the system. With due considerations to the problems, a major effort was put to improve the layout of generator complex. Two D-50 dozers were deployed to level the uneven terrain filled with boulders between the C-block and the generator complex. Bhaskara complex, comprising of three containers, disjointed and lying separately, was shifted towards the 'A' block and assembled in a star fashion, identical to that of Aditya complex and thus giving a symmetric look to the complex. The containers were kept at a height of two feet from the ground on iron blocks, thus, providing free passage of air below the container for cooling. Welding metallic sheets at the top and bottom surface covered the triangular space formed between the three containers. This layout prevents the ingress of snow during blizzards, thus allowing these generators to be used during blizzards efficiently without much of inconvenience.



Fig. 17 : The earlier layout of Bhaskara and the new positioning

Surya complex was shifted further to the centre and the layout of the containers was also changed with two containers having the generators in front and the container with the display panels and change over assembly in the rear. Galley persons can easily access these generators now even in bad weather.



Fig. 18 : Earlier location of Surya complex and the new location

Construction of Galley Route

The generator complex is located at a small distance from the main building of Maitri and members on galley duty are required to go on hourly basis to monitor the smooth functioning of generators. This job becomes more difficult during the bad weather days with raging blizzards. A temporary blizzard line used to be placed from time to time. A new galley path, about 150m long was constructed using the available concrete slabs. Also, a permanent blizzard-line with a proper railing over iron poles was constructed all along the path. This creation facilitates the galley persons to perform his duty during polar nights and inhospitable blizzard days with considerable comfort and convenience. This conceptual addition is of permanent nature and has replaced the old rope system, which needed regular monitoring and replacement.



Fig. 19 : The new look of levelled rear station area, generator complex and galley route with blizzard line

Recovery of 10 KL Fuel Tanker from Dozer Point

A 10 KL fuel storage tanker that was buried in soft snow near Dozer point (situated about one km west of Maitri) was recovered with the help of Mantis crane and placed beside the other storage tankers at Maitri. The storage fuel tankers behind the generator complex have also been cleaned and relocated as per operational convenience.



Fig. 20 : 10 KL fuel tank recovery operation

Repairs and Restoration of Workshop Gate

Structures at Maitri are made up of wooden panels, modular tin sheets and metallic beams, which are subjected to extreme sub zero temperatures, blizzards and heavy winds measuring up to 150 km / hr. Routine maintenance and minor repairs of these structures and life support systems is being carried out by the logistic team from time to time. Silicon sealant and wooden battings are used to plug in the cracks and holes to prevent the ingress of snow. However, the logistic team due to its small composition and limited resources can't undertake major repairs. Unfortunately, the front side of workshop shed was blown away in a severe blizzard during the month of June 2005. The damage had to be restored immediately to prevent further damage to the structure due to inevitable blizzards in subsequent period during polar nights and even later.



Fig. 21 : The workshop gate after the blizzard

The repairs involved a major welding work, fixing of angle irons, cutting of tin sheets, drilling and riveting work. Strong winds, with low temperatures well below minus 32 degrees and absence of a welder in the logistic team made the going very difficult. The crane couldn't be started due to low temperatures and it became extremely difficult to hold the heavy structure manually, in such winds. The work had to be halted in-between for few days due to a subsequent blizzard. In spite of all the odds, after putting relentless efforts for more than three weeks workshop gate was restored to its original state with reinforcing elements.

The huts and the toilet modules for summer camp were placed about two hundred meters away from Maitri, which accommodates the summer scientists. Some of these huts were also used during the winter period for storing instruments etc. These huts had not been arranged in a symmetrical order which led to an unkempt appearance and unnecessary accumulation of snow during the winter months. After a serious thought and considering all the requirement and terrain based criteria, the area starting from main station building to summer camp up to the lake was thoroughly levelled using dozers, cleaned and all the smaller establishments / huts were relocated. The summer huts and toilet modules were relocated with due considerations of topography, wind direction, convenience of the inhabitants and aligned along the newly laid out route.



Fig. 22 : Repair work during polar nights and restoration of the workshop gate

Relocation of Summer Huts



Fig. 23 : Levelling of summer camp area, making of utility pathways and repositioning of summer huts

Environmental Cleaning Around Maitri and Its Environs

“Habitat is the reflection of inhabitants”. Thus, massive cleaning operations of Maitri and its surrounding areas were undertaken. A large number of construction material, scientific structures, barrels, steel wires, wooden panels and other waste materials which have been dumped around the surroundings of Maitri over a period of time has been removed and shifted to Kuber complex (scrap yard). Piston Bulleys and helicopters were pressed into environmental cleaning operation involving all the expedition members in a well organized way. More than 20 tons weighing unserviceable items and garbage were shifted and stored at Kuber complex for backloading to the mainland.

A large number of communication and electrical cables, which were not in use, were segregated and removed from Main station building and summer camp.



Fig. 24 : Segregation and shifting of waste materials using helicopters and vehicles



Fig. 25 : Removal of redundant, old communication and electrical cables from the structures of Maitri

Cleaning of Soak Pit and Klargesters Area

Stringent waste disposal norms and utmost care was observed throughout for disposing all the effluent discharge / waste material. The waste water from bathrooms, toilets and kitchen was fed to the Klargesters system, which cleans the waste water discharge before finally disposing into the soak pit. Two Klargesters were located adjacent to the C block of Maitri that were maintained and cleaned up along with the soak pits on regular basis.



Fig. 26 : The Klargesters and soak pits

Relaying of Electrical Cables and Fuel Line

The old rubber fuel lines from the storage tanker to the generators were prone to developing cracks during winter periods. This recurring problem of fuel spillage was a potential fire hazard besides environmental pollution. This aspect was taken care of, by relaying the complete fuel line with metallic pipes as a permanent solution. The fuel line has been laid all along the galley route so as to identify any leakages easily. Also, a proper under-carriage has been made for the electrical cables from the generator complex to the main building all along the galley pathway using packing wood. This system has eliminated the chances of short circuits, resulting into electrical fires. Since the wires have been placed well above the ground on the under- carriage, there is no cracking of wires due to low temperatures or snow accumulation.

Floor Panelling of Corridor

The main Block ('B' block) of Maitri is about 75m long with a corridor in the centre and living rooms on either side of it. All the water pipes, from the boiler to the rooms for heating run below the corridor floor. The floor

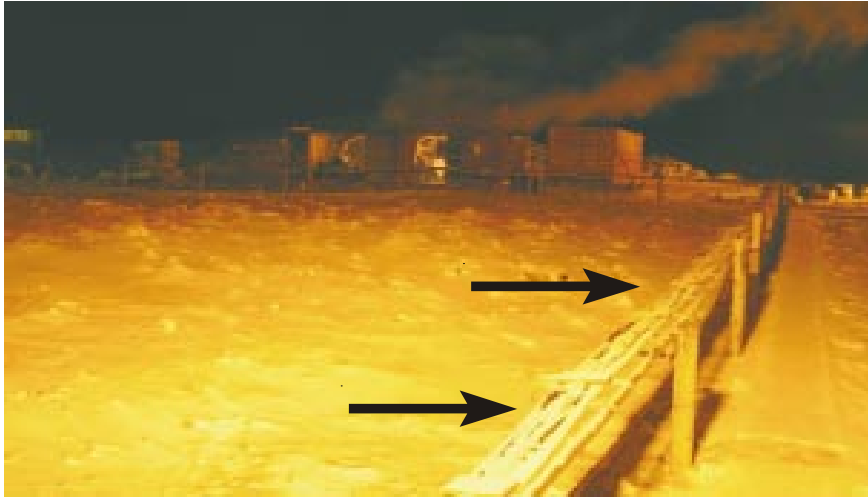


Fig. 27 : The carriage for electrical cables

panels were removed from time to time to repair any leakages and blockages in the pipeline and over a period of time these panels had worn out and got damaged. Due to its improper fit, these panels used to make a lot of noise while walking over it. Complete floor panelling was redone using the discarded hutment-panels lying in the scrap yard. The jute mat of the corridor has been replaced by vinyl mat, thus, improving the ambiance.

Sorting of Containers in the Container Complex

Space and material management are the most important aspects for running any Antarctic station efficiently. Over a period of time lot of unwanted stores and containers have accumulated in this complex and there was no place for new containers. The stores need to be staked properly in these containers and all the unserviceable items to be back loaded along with the containers, thus, creating a little space. The containers need to be rotated with each expedition in order to avoid dumping of containers in Antarctica.

Creation of Trailer Complex

There was not enough space available for parking the trailers in an orderly fashion lest placing the loaded trailers after the return convoy was always a big problem. Moving out the unnecessary containers and half-bins, an additional space adjacent to the workshop has been created for parking the trailers. The trailers can now be parked in this area while being towed to the vehicle. Trailers can be manoeuvred easily to shift the load to its specific location, as enough space has been made available for a large turning radius.



Fig. 28 : The unplanned old complex and new container complex after realignment



Fig. 29 : The trailer complex



Fig. 30 : An aerial view of container complex

Miscellaneous Repairs

Platform of one of the five-wheeled trailer was badly damaged during the previous expedition which could not have been used in that damaged state. The existing platform was replaced by a sledge platform which was lying unused in the scrap yard. The platform was reinforced on the trailer by welding iron plates along the cross members and thus was effectively used in all the convoys. Engine of Liebherr Crane was overhauled and made operational. A log periodic (LP) antenna was installed adjacent to Maitri main building with the help of Mantis crane which gave services for effective communications. Hydraulic pump adjustments in to Piston Bulley 'Pampa' made this vehicle serviceable in convoys.

Except a few, almost all the Piston Bulleys have hydraulically operated blade in the front which can be moved in all planes with the help of a joystick. These blades are meant for clearing the soft snow but they were being used for pushing the loaded trailers from behind on steep slopes and blue ice fields whenever the towing vehicle were unable to pull the load. Due to this unavoidable but improper use, most of the blades had been

damaged and were malfunctioning with impaired movements in all other directions excepting on the vertical plane. All the hydraulic blades fitted on PBs were repaired and made operational. An effective heating device was fabricated for the workshop by modifying an unserviceable old fuel based incinerator module lying in scrap yard.

A four-axle trailer has been lying off-road for the last five years. Though the chassis of this trailer was in a very good condition, all the axle assemblies including the springs and bushes were damaged. The wheels and tracks had already been removed. The spares required to repair this four-axle trailer were available at Maitri but the repairs were not undertaken in previous expeditions due to mammoth work involved. All the springs and bushes were replaced and new axle assemblies were fitted in this trailer and it was put on road after an effort of more than twelve days. A total number of ten trailers were handed over to the next team in proper conditions except one which was unserviceable for want of wheels.

The hoist-boom of Mantis crane at Maitri had developed technical problems. Hydraulic fluid was leaking from the piston seals. The repairs were attended and successfully replaced the seals after removing the hoisting piston thus rendering perfect working order to this crane. Blowers and a 5 KL coolant tank was fitted in Bhaskara generator complex.

There were two OBM units at Maitri for carrying out scientific work in lakes. The assault boat and the OBMs were lying out of order. One of the OBM was repaired successfully after fabricating the bush and adopter for propeller assembly. The assault boat was also repaired by putting a patch with the help of rivets. The OBM was used on a regular basis for carrying out summer scientific tasks of 25th expedition.

Cargo Unloading at the Indian Bay

Due to harsh summer conditions, the fast ice, attached to the shelf in Indian Bay region, cleared off a bit early and the ship was brought alongside the shelf on 21st January 2005. The fuel decanting operation was completed within 24 hrs and a total of 365 KL of fuel was pumped out of the ship and put into the storage tankers, lined up on the ice-shelf. The offloading of cargo was also completed by 22 January 2005.

Logistic Support to Ice Core-drilling Project

An ice core drilling project was planned on the ice cap near Wholthat mountain ranges, about 70 km South of Maitri during the summer activity



Fig. 31 : The unloading operations at Indian Bay



Fig. 32 : Snow accumulation over vehicles and ice coring units during the journey to drilling site

of 25th expedition. After doing an aerial reconaitory survey with the help of helicopters, a suitable route was identified over the polar ice.

A convoy comprising five Pisten Bulley vehicles was under taken successfully on 29 Jan 2006. The convoy had to be undertaken in blizzard conditions and due to ongoing blizzard, the visibility was reduced to less than 5m. The route was totally navigated with the help of GPS, as no landmarks were visible. After successfully establishing the drilling camp the convoy returned back to Maitri on 01 February 2006. The weather conditions remained very bad and hostile throughout the return journey.

Fabrication of Mounting Bracket for Ground Penetrating Radar (GPR) Survey by GSI

A project for mapping the ground profile and depth below the ice cap in Schirmacher area and its surroundings using GPR equipment was planned by the GSI members of summer team which required installation of the equipment on Pisten Bulley using indigenously available materials. The



Fig. 33 : The ice core drilling site of GSI in the interior of polar ice

mounting bracket was fabricated in workshop and one GPR antenna was mounted on the front assembly of Pisten Bulley vehicle after removing the snow blade. A trolley was fabricated for pulling another GPR antenna behind the vehicle.



Fig. 34 : Brackets mounted on Pisten Bulley for installing GPR devices

The equipments were first tested near Sankalp point and subsequently used successfully in mapping areas on the ice cap for which logistic support was provided on regular basis.

Training to Members of 25th Expedition, Joint Convoy and Cargo Operation

Onsite training was imparted to all the new logistic team members of 25th expedition ever since their arrival on 10 January, 2005. The new team was explained about the functioning of various life support systems, vehicles and communication at Maitri. Joint convoy and cargo operations at the Ice Shelf were undertaken together. Mv. Paardeberg was brought alongside the shelf on 20 February, 2006. Fuel decanting operation was completed by 23 February 2006 after pumping out a total of more than 260 KL of fuel from the ship into the storage tankers lined up on the ice-shelf. The joint convoy was under taken on 24 February 2006 which reached shelf at 2300hrs on the same day in about 12 hours. A total of eight Pisten Bulley vehicles were used in the convoy.

The unloading of cargo from the ship couldn't be started before the forenoon of 25th February due to bad weather and heavy winds. However, the unloading operations commenced at 1600hrs on 25 February 2006 amidst heavy winds of 35 knots and the last container was unloaded at 0400hr on 26th February 2006. A total of 23 containers, two half-bins, one Mantis crane and one Pisten Bulley 300 were unloaded.



Fig. 35 : Unloading of the expedition cargo along shelf at India Bay

Technical Reports of XXIV Indian Scientific Expedition to Antarctica

The Technical Publication No. 22 pertaining to the XXIV Indian Scientific Expedition to Antarctica embodies the collection of scientific papers as an outcome of scientific projects undertaken during the austral summer as well as wintering period with effect from December, 2004 to March 2006. New programmes including to those of Malaysian scientists under International cooperation scheme and major ongoing projects by the regular participating organisations and Indian universities formed various disciplines of Antarctic research during this expedition.

Meteorology and Atmospheric Science, Earth Science, Glaciology and Climate Change, Biology and Environmental Science, Human Physiology and Medicines and Engineering, Communication & Logistics were the disciplines under which various core participating organizations and supporting institutions as already mentioned above covered the areas of research which are presented in this technical report.

ACKNOWLEDGEMENTS

The National centre for Antarctic and Ocean Research has extended all possible facilities and support to effectively execute the scientific objectives and logistic tasks. The first ever Ministerial visit comprising eight members high power Indian delegation including Mr. Kapil Sibal, Hon'ble Minister of Science and Technology proved to be a turning point in our National Antarctic Programme. All the expedition members were immediately benefitted by the generous enhancement in the allotted telephone time and overall improvements in the facilities owing to the futuristic vision and their recommendations.

The impressive success in achieving all the assigned as well as perceived targets was only possible due to the collective efforts through dedicated teamwork, unselfish caring and commitment of each expedition members which deserve appreciations. The proactive support received from the heads of various participating organisations kept motivating the participants throughout the tenure. I am particularly indebted to the Director General, Geological Survey of India, Director, NCAOR for giving me the opportunity to lead this significant expedition. My sincere thanks are also due to Late Shri M.K.Kaul, Shri Rasik Ravindra and colleagues at Antarctica Division, GSI for their unflinching support and encouragements. S/ Shri Prakash Kumar Shrivastava, Senior Geologist and Pradeep Kumar are especially thanked for their help in the processing of this technical report.

I owe final acknowledgements to my wife, children and family members who have contributed in all my Antarctic ventures in more ways than they know by enduring repeated and long absences.