

The Diary and the Highlights of The Nineteenth Indian Antarctic Expedition

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The 19th Indian Antarctic Expedition team comprised 47 members representing 15 scientific departments and 4 logistic organizations. The scientific units were GSI, IIG, NGRI, IMD, BSI, ZSI, BSIP, NEERI, SASE, SOI, NAL, DIPAS, INMAS, RDEE and Bhopal University. Logistic teams were drawn from Indian Army, DEAL, ITBP and Central Health Services. One geoscientist from Lima University of Peru joined the team on board ship, taking the team strength to 48 members.

Expedition Launching

The team assembled at Vasco in Goa on 3rd December 1999. The next three days were utilized for completing formalities of customs, immigration, foreign exchange, passport and visas. Preparatory lectures on various aspects of expedition activities were delivered by Mr Rasik Ravindra of GSI, Dr Manju Mehta of AIIMS, Col Rathi of Indian Army and Mr Bhaskara Rao of NCAOR. A practical fire-fighting training was organized at Goa State Fire Fighting College at Panjim.

On 6th December 1999, Dr P.C. Pandey, the Centre Director, organized a Press meet in the premises of the NCAOR and announced the details of the plans, tasks and responsibilities of the 19th expedition. Till the previous year, all the expeditions were launched from the shores of Goa. This was to be the first expedition to sail off from the ports of a foreign land, i.e. from Cape Town in South Africa. The shifting of the launching site promised to cut down the sailing time to almost one-third, from 27 days to 9 days to reach the Antarctic coast; and thus the resultant financial savings. Since this was the first expedition team to fly to South Africa, many unanticipated constraints were imposed regarding the bulk cargo. As a result, late demands from the Indian Antarctic Station, as well as delayed supplies from the vendors, could not be taken along like the past expeditions. The team had to brave out these unforeseen "teething troubles".

The team left Goa by air in the afternoon of 6th December, arrived at Mumbai, shifted to the International Airport, and soon after midnight boarded

a Mumbai-Johannesburg flight. Another change of aircrafts at Johannesburg and the team arrived at Cape Town. Mr Manjeet Singh Puri, the Indian Consul at Cape Town, welcomed the team on behalf of the Indian High Commission in South Africa. A six-member team of Pawan Hans, with two Bell Helicopters, joined the team on board ship, Magdalena Oldendorff. Two days were spent in cargo loading operations.

An official send off function was arranged on board ship on 9th December, 1999. It was attended by the South African Minister for Environment, Mr Wali Moosa, and the Indian High Commissioner, Mr Bhasin. The same day, around mid-night, Dr Pandey, Director-NCAOR, flagged off the expedition from the port of Cape Town.

Voyage

This was the maiden voyage of Magdalena Oldendorff to the Antarctic waters. An Ice Pilot, therefore, assisted the Master of the ship. The entire team was housed within the superstructure of the ship in twin-sharing cabins. The facilities of catering, galley, dining, gym, sauna, pool and dispensary were adequate. Just after two days of sailing, the ship reached the roaring forties. The first iceberg was encountered at 54 deg 16 min South latitude on 14th December. Two days later, the ship entered pack ice zone at 61 deg 30 min South latitude. On 21st December, the ship weighed anchor on fast ice, at 69 deg 39 min South latitude and 11 deg 42 min East longitude. Bad weather prevented work for two days and in the evening of 23rd December 1999 the first helicopter sortie reached Maitri station.

Camps

On the very next day, i.e. 24th December, the summer camp at Maitri was made operational. With the Antarctic weather playing hide-and-seek, by the time all the scientists reached Maitri summer camp, it was 30th December. On the last day of the year, an under slung load was dropped by Pawan Hans Helicopters on fast ice, from a height of about 300 meters. A salvage operation was launched immediately but many scientific equipment of IMD, NAL, IIG and NEERI were damaged in this accident.

For the work on the ice shelf, a camp was established at Dakshin Gangotri on 7th January, 2000. It was manned by SASE and IIG and remained functional till 17th February.

For the mountain work and polar plateau route reconnaissance, many recee sorties were taken. Finally a camp was established at Gjeruldsen hogd nunatak near 72 deg South latitude. It functioned till 30th January. Another

camp for geological work was established near Baalsrudfjellet nunatak from 4th to 10th February, where GSI team carried out detailed geological traverses. The Peruvian geologist also camped with this team.

First Convoy

As seen in the weather charts this year, the sea-ice condition around Antarctica was worst in the last one decade. This exceptionally cold summer was also reflected on the ice shelf, which was unusually devoid of melt-water streams, so common during every December. These adverse weather conditions were put to our advantage by organizing convoy route recce sorties on 25th and 26th December. Since it was against the tradition of the Indian expeditions, there were many skeptics. But after preparing all the vehicles, the first joint convoy was launched on 1st January and it reached the ice shelf on 2nd January 2000. This was a historical achievement as the first ever-surface convoy attempted by any Indian team was successfully undertaken during the peak polar summer month of January.

The army team for polar plateau route recce utilized this opportunity to test the skidoos for long journeys on ice. Two members of GSI team joined the recce team and the foursome followed the convoy on two skidoos. Covering the entire distance of more than 100 km on snow-scooters gave them a first hand experience of the difficulties of exposed travel on polar routes. The lessons learnt from this maiden skidoo adventure provided useful inputs for planning any future plateau expedition.

Cargo Offloading

The first successful convoy provided us with the unique privilege of having six pairs of vehicles and trailers on the ice shelf. This immensely helped in offloading the fuel and other cargo. Though India Bay was still frozen, yet moving along the cracks, the ship succeeded in reaching within 20 meters from the nearest projection of the shelf. Taking advantage of this opportunity, all the tankers were moved to this new part of the shelf and by 13th January, the entire load of 330 kl of fuel was discharged. Simultaneous operations were maintained by our fleet of vehicles and the entire fuel was shifted to Dakshin Gangotri for safe storage. This again, was the earliest ever discharging and shifting of fuel during any Indian expedition.

A high tide broke up the remaining fast ice and on 20th January, the ship could come alongside at this new projection of ice shelf. On the same day, the entire cargo was offloaded and shifted to Dakshin Gangotri by the vehicles and trailers. It is worth mentioning that India Bay was covered by

fast ice even in February, but by choosing a new site of offloading on shelf and utilizing the fleet of vehicles from the first convoy, the ship was made free from the obligation of cargo offloading by 20th January itself. This is the earliest successful completion of cargo operations in any Indian Antarctic expedition.

The Scientific Work

The helicopter service company, i.e. M/S Pawan Hans, created one of the major constraints to scientific work in this expedition. Soon after dropping one underslung load on fast ice, they refused to undertake any further underslung loads. All the negotiations through the NCAOR were fruitless and this effectively ruled out any mountain work by any department. Thus, the GSI team could not undertake its major task of mapping in Muhlig-Hoffman Mountains. The recce team could not receive back the skidoos from the ice shelf for further exploration in the mountains and proposed work by BSIP, BSI and ZSI in far flung western lakes of Schumacher Oasis could not be undertaken as the boats can only be transported underslung and not inside the helicopters. In addition to this, the scientific equipment damaged by the helicopter, dropping the first load on fast ice, hampered the work of IMD, NAL, NEERI and IIG. With these limitations, all the other scientific tasks were successfully completed.

Polar Plateau Route Recce

There was a two member recce team in this expedition, having an objective to search a surface route from Maitri to the polar plateau, as a first step for planning any future expedition towards the pole. From the study of the available maps, they selected Somovken glacier as the most promising possibility, due to its larger dimensions and gentler slopes. Many aerial recce sorties were taken over this glacier and a tentative zigzag path was plotted by GPS markings, which appeared to be crevasse-free. On 27th January, the recce team explored this route by two skidoos, supported by two Pisten Bulley vehicles. They were fortunate that the plotted route actually turned out to be free from concealed crevasses and the vehicles could safely reach on the polar plateau up to 72 deg 11 min South latitude. The route established is gently rising and free from crevasses and major sastrugis. This is yet another milestone in Indian polar exploration as for the first time Indian vehicles have stood on the polar plateau and a route is open for further scientific work.

The End of Polar Summer

The taking over of the Maitri station from the old wintering team was done on 15th February. By that time almost all the scientists had completed their tasks. The summer camp was closed on 20th February and the scientists started shifting back to the ship. A day before that, on 19th February, the first return convoy reached Maitri with four loads. These vehicles were readied for another trip, and on 22nd February, the second convoy left Maitri with two back loading containers. This return load was also taken on board ship and thus all the tasks of the expedition were completed successfully. Permission was obtained from the Secretary-DOD and the ship sailed back from Antarctica at 1930 hours GMT on 23rd February, 2000.

Scientific Work during the Wintering Period

The scientific departments represented in the wintering team were GSI, NGRI, IIG, I MD and SASE. Three ongoing glaciological investigations were continued by the GSI: monitoring of advance and retreat of DG glacier snout in Schirmacher, observing the annual migration of active layers of permafrost near Maitri station, and recording accumulation-ablation patterns on the ice shelf. These experiments provide inputs for global warming trends. In addition to these observations, an important find is the discovery of a "glacio-fluvial pebble bed" in the extreme glacial environment of Antarctica. NGRI conducted two experiments: collection of data and maintenance of Seismological Observatory and Permanent GPS Tracking Station. More than 400 earthquakes of varied magnitude were recorded during this period. IIG maintained Fluxgate Magnetometer and Riometer for monitoring the interactions between magnetosphere and ionosphere over this part of the globe. Also, the 'Whistler Project' of Bhopal University for recording VLF phenomenon in the atmosphere was continued by IIG. Round the year synoptic met data was collected by IMD for daily temperature, pressure, wind and clouds. About 50 balloons were launched for ozone measurements. SASE studied the 'albedo' of snow and ice media and initiated a study of microstructures of ice samples. For the albedo work, an Automatic Weather Station was maintained on continental blue ice south of Maitri.

Logistic Work during the Wintering Period

When this expedition team was flagged off from India, it was known that only one Satellite Terminal for communication was functional in Maitri.

As the Expedition Leader, I had raised serious concerns about this issue in Goa and had detailed discussions with the Director at NCAOR. However, any spare set could not be procured in time and the expedition had to take up this challenge of wintering with a single communication terminal. Our worst fears materialized during the peak polar nights. One powerful blizzard damaged the lone terminal in May 2000 and the team was cut off from the rest of the human civilization. The magnetic storms during winter period do not permit even proper HF Radio Communication, making the isolation almost total. With the help of a weak window of HF, a message was conveyed to DEAL in Dehradun, informing about the collapse of all communication channels. It was a very difficult situation, as the wintering members were cut off from their families not only physically, but even from enquiring any welfare. However, the members braved it out, sportingly. Meanwhile, we had cut a passage through the thick wooden roof of the station, to create an access to the damaged satellite dome. The communication team went on trying to replace various subsystems of the satellite terminal. Finally, the fortune favoured the brave and one single telephone line was restored. This was the single lifeline of the team, till January 2001, when the next team arrived with four new terminals.

We had received only three generators in working condition from the previous wintering team. Our army team repaired all the remaining generators and installed two new 125 kva gensets. Thus, we handed over ten working generators to the next wintering team. The entire fleet of 8 snow vehicles was maintained excellently and handed over to the new team in running condition. One Mantis crane was handed over to us abandoned and buried in snow at Dakshin Gangotri. It was recommended for backloading to USA for getting repairs done by the suppliers. Our team camped at Dakshin Gangotri, dug out this crane and by replacing needed parts, made it operational. This has resulted in saving of a huge amount of precious foreign exchange, which would have been spent on its transportation and repairs in USA.

The Engineers team from the Army constructed one new bathroom, one guest room in 'A' block, one X-ray room, a new carpentry workshop, and a new plus-four deg freezer for fresh supplies during the summer period. Also, a pipeline was laid from station to the summer camp, eliminating the temporary rubber hose and its problems during every summer.

Inspection of the Indian Station by Norwegian Team

On 7th January 2001, the Indian station Maitri was inspected by a seven-member Norwegian team, which included TV-crew and Press, under

the Antarctic Treaty System. It was headed by Ambassador Jan Holik. The inspecting team gave only 24 hours' prior notice and carried on with a very detailed job, covering each and every aspect of the station, stretching from 08:30 AM to 03:30 PM. The Environmental Adviser of this team, Ms Birgit Njastad, was a member of the 1996-inspection team also. So, she could compare all the environmental development in the past five years and was full of appreciation. The visitors were also much impressed by the concept of our "one hour of voluntary work everyday" by all the wintering members for cleaning up the station and its surroundings. These findings were presented in the SCAR meeting at St. Petersburg in May 2001 and have enhanced the Indian standing among Antarctic nations.

Handing Over the Station

This wintering team had spent the entire year of 2000 away from the motherland. It was significant not only for the 24 members of the team but also historical for the Indian Antarctic programme, as for the first time an Indian lady, the team doctor, wintered over on this isolated continent. This has opened up new vistas of scientific adventure for all Indian women. Having maintained the Indian Antarctic station in prime condition for more than one year, Maitri was finally handed over to the next wintering team of the 20th expedition on 18th February 2001.

The ship sailed back with our team on 10th March 2001. Taking back a flight from Cape Town in South Africa, the team arrived in India on 22nd March. Thus, the 19th Indian Antarctic Expedition has spanned a period of 472 days, starting from 7th December 1999 and ending on 22nd March 2001.

HIGHLIGHTS OF THE 19th EXPEDITION

- 1. First Offshore Launching:** This was the first Indian expedition team that was launched from Cape Town, South Africa instead of Goa in India. Pioneering a new route and using foreign shores resulted in many unforeseen logistic challenges.
- 2. The Team:** It was a 48-member multidisciplinary team drawn from 15 scientific institutions and 4 logistic organizations. One geoscientist from Peru, a lady from Lima University, also participated in the Indian programme.
- 3. Scientific Targets:** With the exceptions of limitations posed by helicopter services, all the targets set for various scientific institutions were achieved. The discovery of "glacio-fluvial signatures" on some pebbles is an important find.

4. **First-Ever Surface Route to Polar Plateau:** A safe surface route was explored and established for the first time for vehicles from Maitri to the polar plateau, along the heavily crevassed Somovken glacier. For the first time Indian vehicles have reached the polar plateau. This achievement has opened new areas of scientific research for the Indian polar programme.
5. **Earliest-Ever Convoy and Cargo Offloading:** Utilizing the adverse ice conditions, the earliest ever convoy was organized on 1st January 2000 and the resultant availability of six vehicles on the ice shelf allowed an early discharging of fuel by 13th January itself. Selecting a new offloading site, all cargo was offloaded and shifted to Dakshin Gangotri by 20th January. This is creditable as all this offloading was done even while India Bay was frozen with fast ice.
6. **Repairs of all Non-functional Gensets, Vehicles and Cranes:** Our team received only three functional generators from the previous team. We not only repaired the remaining five gensets, but also installed two new gensets, and thus handed over ten functional generators to the next team. All the eight vehicles were given to the next team in running condition. One buried Mantis crane, recommended for backloading, was dug up and repaired; saving a huge amount of precious foreign exchange.
7. **New Constructions in Maitri:** The entire 'A'-block of the station was renovated. We constructed one guest room, one X-ray room, one carpentry workshop, one new plus four-freezer room and a new bathroom in the station. Also, a new water pipeline was laid from Maitri to the summer camp.
8. **Repairs of the Lone Communication Terminal:** The only INMARSAT terminal available with the team crashed during the polar nights. The team braved the absolute isolation from families, departments and the entire human civilization. After lots of efforts, the communication team finally succeeded in making one single phone line functional by replacing various subsystems of the satellite dome.
9. **First-Ever Wintering by an Indian Woman:** For the first time, an Indian lady, the team doctor, mustered the courage to stay back in the isolation of this icy continent for the entire duration of 16 months of polar wintering. This successful achievement has opened up new horizons for all Indian women in the fields of polar science.
10. **Inspection of Indian Station under Antarctic Treaty Terms:** The Indian Antarctic Station Maitri was inspected by a high level

Norwegian Inspection Team under the terms of the Antarctic Treaty. The official delegation, along with accompanying journalists and TV-crew, were all praise for the environmental upkeep of the station.

Acknowledgements

I am thankful to Dr Harsh Gupta, Secretary-DOD and Dr PC Pandey, Director-NCAOR for the supervision during the expedition. The help received from Sh TVP Bhaskara Rao, Director-Logistics in NCAOR and also the Observer during this Expedition, is gratefully acknowledged. I am thankful to the Director General, GSI for his kind permission to lead this expedition. I am indebted to Sh M.K. Kaul and Sh Rasik Ravindra, Directors of Antarctica Division of GSI, during the launching and ending of this long wintering period. The co-operation received from Sh M Javed Beg, Dy Leader of the Expedition and from Sh Ajay Dhar, Station Cdr of the previous wintering team is put on record. Finally, thanks are due to all the members of the 19th expedition, whose motivation and contribution has made this team effort an outstanding success.



First-ever launching of an Indian Expedition from Cape Town, South Africa.



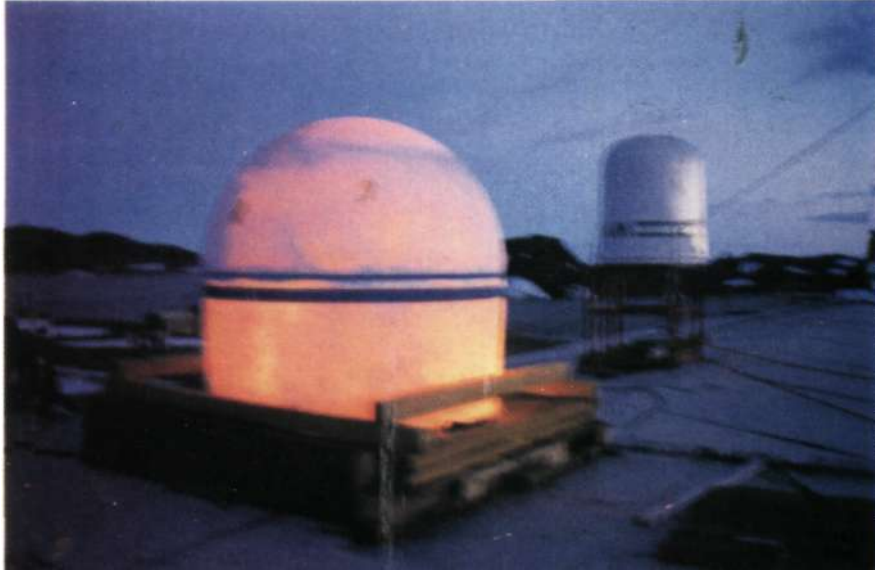
Earliest-ever offloading of all cargo and fuel, achieved within January month of year 2000.



Installation of two new 125 KVA generators by cutting the roof of the containers.



Laying out a new water pipe line for the summer camp at Maitri.



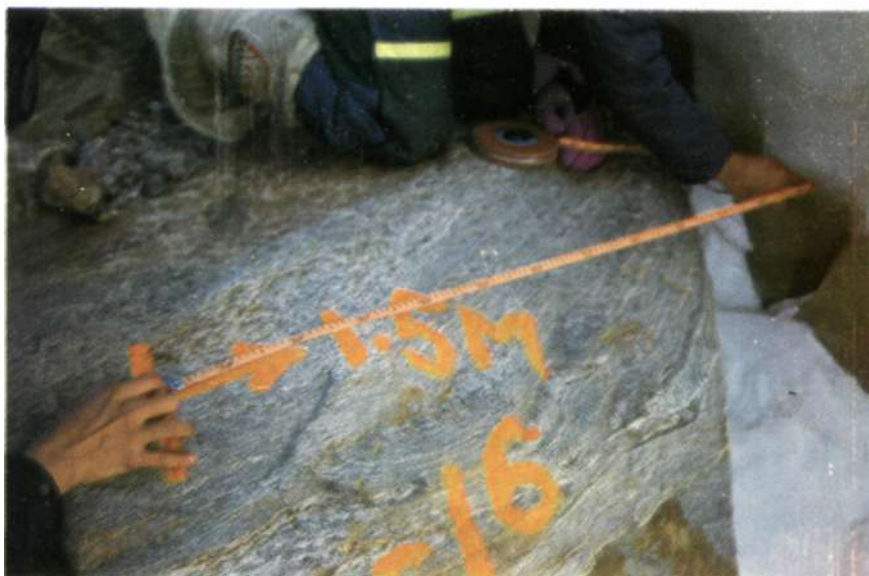
Successful repairs of the lone satellite terminal during Polar Night.



Re-location of toilet modules without dismantling; apart of environ-clean up.



Field-view of the Glacio-Fluvial "Pebble Bed" found In Schirmacher Range.



A month-to-month confirmation of DG-Glacier Recession, a pointer to Global Warming Pattern.