

## **Report on the Logistic Activity Carried out by the 20<sup>th</sup> Indian Antarctic Expedition**

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### **Introduction**

The 20<sup>th</sup> Indian Antarctic Expedition had a logistics team of 13 members drawn from the Indian Army. The team primarily was responsible for providing logistic back up to the Indian Antarctic Scientific Expedition and to maintain and run all the life support systems at the Indian Antarctic base-Maitri. The main logistic tasks assigned to the team were as enumerated below.

1. Upkeep of station infrastructure and all its life support systems.
2. Up-gradation and regular maintenance of land convoy vehicles and support systems.
3. Testing and commissioning of new SATCOM terminals (B, C&M) at the Indian base.
4. Upkeep of fire fighting equipment at Maitri and updating the serviceability of all fire fighting equipment.
5. Upkeep of natural habitat of Maitri and its surroundings in compliance with the environmental protocol requirements.
6. Re-laying of the Station heating pipelines from Boiler room.
7. Transportation of fuel and bulk stores from India Bay to Maitri.
8. Re-commissioning of Polar Bear Vehicle.
9. Retrieval of Polar Bear Trailer from Blue Ice.
10. Stock taking of spares of all life support systems and vehicles and projecting demands for future procurements.
11. Providing logistic support to the scientific activities.
12. All other tasks as assigned by the Leader of the expedition from time to time.

The logistic team made a concentrated effort braving the blizzards and Antarctic chill to complete the entire task it was assigned. The extreme

Antarctic conditions did not prove to be a major hindrance. The logistic task carried out by the team is as listed below.

### 1. Activities on board ship "M/v Magdalena Oldendorff"

**Issue of clothing items:** The Extra Cold Climate (ECC) clothing was issued to the entire team as per the directives of Leader. The issue was organized in an orderly fashion keeping in consideration the size of individual member.

**Problems faced:** The main problem faced during the issue of the clothing was that there were inadequate number of Medium sized clothing. This caused a lot of problems to team members as majority of them had to wear incorrect size clothing.

**Readjustment of cargo:** The cargo in the containers was readjusted to minimize the number of loads to be taken by convoys as well as identify and separate the items that would be required to be sent on priority by the air sorties. This exercise was carried out in great detail and resulted in entire scientific cargo being shifted to Maitri in just three days, saving a lot of flying hours.

**Planning of helicopter sorties:** This was done with utmost care to make optimum use of all helicopter sorties to and from the ship (Fig.1).



Fig. 1: Helicopter operation being carried out from Ship M V Magdalena Oldendorff.

Priority was given to move a sizeable detachment of the logistic team and scientists to Maitri, to establish the summer camp and then shift the stores required for summer tasks and setting up of various field camps.

## 2., Activities during the summer period

**Activation of Summer Camp:** The summer camp was activated by the 17<sup>th</sup> WOT at Maitri. A part of the army team was moved to carry out maintenance work for the living huts, toilet module and incinerators. The toilet incinerator burners were checked and made functional.

**Taking over of various stores:** The important task of taking over of the vehicles, life support systems and stores was carried out simultaneously with other summer activities. The new logistic team received on job training on the installed life support system at Maitri. This was an important aspect of induction of the team as most of the new members had no experience of functioning under such extreme conditions.

**Establishment of Dakshin Gangotri Summer Camp:** a summer camp was established at the Dakshin Gangotri station site for Indian Institute of Geomagnetism (Fig. 2). This involved overhauling a 30 Kva generator lying unused at DG station site and relocating the living module. A Mantis crane located at DG station site was made operational.

**Survey of India Camp (SOI):** A living module on sledge named 'SANKALP' was made operational as a field camp for SOI team which



Fig. 2: Location of IIG summer camp at DG

had a program of surveying a site 6 km west of Maitri. A mini generator and communication equipments were placed at the camp.

**Establishment of WIHG Camp:** The Scientist from Wadia Institute of Himalayan Geology had a program of carrying out Ground Probe Radar Survey on the Polar Ice sheet South of Schirmacher Oasis. A convoy living Module Banjara was made available with a vehicle and two logistic personnel for this work.

**Offloading of bulk fuel and cargo from ship to the shelf:** Offloading the cargo and fuel on the Shelf is one of the trickiest of the task. The team with the help of the earlier wintering team carried out this arduous task without any untoward incident. The team also offloaded the Polar Bear vehicle. The Polar Bear was taken back to Antarctica after having it repaired at the Company in USA.

**Problems faced:** The ship was able to discharge the fuel at some distance from the shelf edge into the storage tankers. Offloading cargo containers was very risky as it involved working on the shelf edge as the Ships crane length was less and the cargo could only reach up to the shelf edge (Fig. 3).



*Fig. 3: Ship on shelf-notice the crane size reaching just the shelf edge.*

**Repair of Mantis Crane at DG:** The old Mantis Crane (2610) lying off road at DG for a long time and was recommended for withdrawal by

the 18<sup>th</sup> IAE. The crane with efforts by 17<sup>th</sup> and 18<sup>th</sup> WOT was made completely functional.

Problems faced: The old crane exhibits very sluggish responses. The problems that exist with the hydraulic drives could not be well diagnosed, due to lack of any formal training on these systems. Attempt have been made by referring to the available literature to make the Crane functional. The crane however shows some erratic responses in the drive and great deal of care and caution needs to be taken by the operator while using it.

**Cargo handling on the ship:** All cargo, which had been brought by the ship, was off loaded onto the ice shelf (Fig. 4). This included stores, fuel, food and other essential items necessary for the survival of the winter over team during the winter months.



*Fig. 4: Fuel in tankers and cargo in containers lying on shelf.*

**Establishment of Satellite Communication Antenna:** Two new INMARSAT terminals were taken to Antarctica during the 20<sup>th</sup> IAE. One INMARSAT Dome was installed at the e mail hut and the other was placed on the Maitri roof using helicopter support.

**Joint convoy:** Joint convoy was carried out on 1<sup>st</sup> March 2001. The convoy enabled the new team to get acquainted with the route and problems encountered. Stores to be backloaded were carried to shelf and during return the essential fuel and cargo was brought back from the shelf.

### 3. Activities during Winter Period

**Convoys:** A total of 11 convoys (Fig. 5), were run from Maitri to DG/ Shelf in the winter period. All the cargo including fuel was shifted to Maitri by these convoys. The containers with items to be back loaded were also taken from Maitri and placed on the ice shelf. All the 20K1 fuel tanks were placed at shelf, for receiving of the fuel from the new team on arrival. Details of the convoys, and convoy route are given in Appx B & C.



*Fig. 5: A convoy heading for shelf*

**Problems faced:** The following problems were faced during the convoys

- (a) It was found that the mobility and reliability of the Pisten Bully 270 did not match up with Pisten Bully 330 due to their vintage. The fleets of 270's are already overhauled once and now need base repairs to cater for major replacement of assemblies, pipes and rubber and electronic parts. They need to be phased out and replaced by 330.
- (b) The old team does impart all possible training to the new members, but within the span of time available many things go untouched, and hence at times during convoys we did face problems. Non availability of adequate technical literature, in English language was also a concern, as fault diagnosis could not be carried out properly and fast. All this is possibly because of no formal training

being imparted to the team members to help them understand the complicated hydraulic drives and electronic controls systems that are of state of art technology, in these vehicles.

- (c) It was noticed that the Hydraulic fluid (ATF66) and Winter grade Engine oil (5W30) that are used, develop a grease like consistency at low temperatures of below (-20° C), this made starting up of vehicles extremely difficult. This can be sorted out if vehicles are provided with proper preheating facility, which will warm up the lubes and oils before the engine is fired.
- (d) The Polar Clothing, especially the Hand Gloves were found to be of very low quality to sustain the extreme cold and rough weather while working outside when on convoy. The old dungarees (Halley Hansen Brand) that were available, were used but most of them were old tattered and hence could not sustain long usage over the entire period. The new overalls from Cape Mart were found to be of just no use during convoys as they provided very less insulation from cold and the material just could not sustain any rough usage when working outside in field and used to tear open at the seams very easily.

**Preparation of Demands:** In the intervening period of polar nights, when temperatures were extremely low and occurrence of blizzards was frequent a thorough stock verification of all items in charge of the logistic team was carried out. All out effort was made to identify the unserviceable items to be discarded/ backloaded. All demands were meticulously prepared and forwarded to NCAOR well within the stipulated time. Recommendations for purchase and inclusion of new equipment, which would require capital investment, were also prepared Documented and sent to NCAOR for their approval and decision making in the month of April/ May 2001.

**Replacement of Pipelines of the Station Heating System:** This team was given the task of replacing the old pipeline used for heating the station. The old pipeline was totally corroded (Figs 6 & 7) over the period of time. It was a very important task as it involved basically shutting down of the Boilers and involved removal of entire Deck Boarding of the lobby, disassembling the old pipes and replacing them suitably. This all was to be done at a great speed and with accuracy, as otherwise the station heating would have got affected and caused considerable discomfort to members. The task was immaculately planned and with the help of all members was executed and completed in just 24 hours.





*Fig. 6: Hot water pipeline being replaced.*



*Fig. 7: The corroded old hot water pipe.*



**Problems faced:** It was found that the Pipes that had been sent did not confine to the existing pipe layout. As no accurate drawing of the layout was perhaps available in India; the pipes were not exact replacements and keeping practicality in mind the new pipes were laid with minor modifications

**Maintenance of Power Supply System:** The Power supply system of the station was maintained following a rigorous routine according to the laid down procedures and at laid down time intervals. Generator No-3 of Aditya Complex was removed and packed for backloading to mainland for major repairs ex-trade. The generators Surya 2 & 3 were overhauled. The Alternator of Surya No. 1 was re-aligned and is now well fitted and functioning very well. The details of Performance state of the generators was sent to NCAOR for necessary action and future planning.

**Problems faced:** The main problems faced were—

- (a) Accumulation of snow in the containers was a recurrent problem during the winter blizzards.
- (b) The Brush type Surya complex generators, give erratic performance at times due to wearing out of the carbon brushes, therefore limited use was made of them during Winter months.
- (c) **The** 125Kva Genset, which are water-cooled type, are a good replacement, but these were not exploited by earlier expedition in winters, hence certain problems were seen. The MEG circuit causes overheating in summers so we tried using coolant in that circuit and the genset performed well. In the beginning of winter freezing of coolant was found to occur in the coolant circuit. This was due to non-availability of the actually designed containers to house these Gensets at Maitri. These generators are presently housed in already existing Bhaskara Complex, which cannot accommodate the entire system as per the recommended layout by the manufacturer.
- (d) The rubber/fibre belts that are supplied by manufacturer are found to fail frequently. This may be due to non-conformity of the material to sustain extreme low temperatures.
- (e) The batteries supplied also do not hold adequate charge when exposed to the low temperatures. On the contrary the batteries with Kassbohrer vehicle, which are of DETA make are found to perform exceedingly well in the prevalent cold climate out here.

**Repair and Maintenance of Vehicles:** Regular and periodic maintenance of all convoy and support vehicles was carried out in addition

to rigorous inspection before and after each convoy. One available 330 Engine was changed after the vehicle developed engine failure during convoys. This team attempted and was successful in assembling a hydraulic pump and engine by resorting to cannibalization of internal spare parts. The work was carried out under extreme weather conditions but the efforts paid off well and the vehicle was put on the road.

**Problems faced:** The main problems faced were—

- (a) No detailed workshop manual in English language is held at Maitri for PB330. This caused a number of repair problems, as not much expertise is available initially when the new team is inducted. The fleet is no longer new and very peculiar problems and defects were seen to develop and diagnosis of the problem itself was at times very demanding.
- (b) The team prior to induction in the preparatory stage is exposed to PM70 type of vehicle in India and it is not possible to get any idea of the type of equipment held in Antarctica from that vehicle. There is a vast amount of difference in the drive mechanics as such. The absence of any good literature and training aids in India complicates the problem. The vehicle is based on state of art technology, perhaps new to the country and hence it is felt necessary that structured, formal training, from the manufacturer will go a long way in ensuring proper exploitation and maintainability of the equipment.
- (c) The deficiency of suitable literature in English was felt for taking up exhaustive repair job. This was required at times because of vintage nature of the equipment.

**Waste Disposal:** The problem of waste disposal prevails almost the entire year. The waste water led out of the Klargesters, into the waste pond, freezes due to the extreme low temperatures. To prevent failure of the discharge from the Klargesters, the pipes leading to and from the Klargesters are trace heated. As only temporary supports exist to the pipes, the trace heat coils fail, when the pipes buckle and give way at the joints. This had to be attended to urgently else the routine of the station comes to a stand still and could lead to an unhygienic environment.

**Retrieval of Polar Bear Trailer:** The Polar Bear Vehicle can tow loads only, with its own special trailer. This trailer was lying near Barrel 133 since long. Over a period of time it was gripped by blue ice on which it had been left standing. As no specialized tools were available after sheer manual work the trailer was cleared off the ice and was placed at 'SANKALP' point for use by the Next expedition.

**Maintenance of DG Area:** During the last convoy, to the shelf/ DG the Porta -cabin, the 30 kva genset and four 10 Kl fuel tanker were relocated with the crane. The Crane itself had to be dug out as it was lying in the zone of snow accumulation.

**Maintenance of Jeevan Jyoti:** The portable Jeevan Jyoti Genset, which was lying in snow since last one year, was dug out with great efforts and use of crane. It was cleared off snow and the engine serviced, started and made functional.

**Painting of Maitri Station:** The entire internal walls of the Maitri station were repainted that included the main lobby, lounge and kitchen. The main lobby, lounge and kitchen were re-carpeted as well. The stilts on which Maitri has been built appeared to rust in certain areas. As a precautionary measure, all stilts were painted with Red Oxide, which should enhance the life of the structure to a great extent. The external walls of the entire station were repainted with single coat of FIRE proof Paint that was available at Maitri. This should also enhance the life of the station. The result of all the efforts is that Maitri now bears a new look.

**Re-fabricating of Tirumala and Library Furniture:** The Tirumala hut, which houses the NGRI lab, was overcrowded with the scientific equipment. After a detailed study of the requirement certain relaying of partitions was carried out. It now has sufficient space for the Seismic laboratory. Similarly new shelves were fabricated for the Maitri Library.

**Email-Hut Renovation:** This team has been successfully using the Email terminal right since our arrival after having set it up. The Email Hut "Girnar" was repainted and fitted with new furniture. Heating arrangements has been made in the hut.

**Fabrication of Emergency Change over Switch for Electrical Power:** The station runs on two power generators operating simultaneously. This system is adopted as it is considered practical and efficient to supply electricity to all the systems at the base. But in case of malfunctioning of any loaded generator, the station complex, the various scientific instruments operating in the labs, satellite communication systems get out of gear. It is not possible to switch on a stand-by generator immediately. This problem was studied and analyzed in detail by the station Engineer and the Station Electrician. The outcome is a new change over, which is now fitted in the boiler room. This enables all the essential systems like communications, station lighting, trace heating, water circulation to be maintained operational with only one generator operating. For this, certain loads are required to be switched off till the time the situation stabilizes.

**Repair of Workshop Shelter:** Due to the high velocity winds during the blizzards, the CGI sheets above the main entrance of the shelter had got ruptured and were blown away leading to considerable ingress of snow in the shed. The accumulated snow was manually removed and new sheets were fitted in location, so as to seal off the rupture.

- **Repairs of "Banjara":** "Banjara" the living module of the convoy is a very essential component of the convoy as it provides shelter during Antarctic climatic extremes. During the last convoy to the shelf a door of 'Banjara was blown off due to a severe blizzard. On reaching Maitri, a new door was fabricated and fitted. Some of the electrical wiring was also repaired and repair of the 2.5Kva Honda genset placed in the 'Banjara' was also carried out.

**Decanting fuel at Dozer Point:** Barrels of Fuel from earlier expedition were lying at the dozer Point. 14 KL of fuel was decanted using pump. The fuel lying at the dozer point had to be removed as it could leak from the old barrels and contaminate the station area.

**Summer Camp / Huts Clearing:** In anticipation of the arrival of the new team, the entire summer camp was cleared of snow and ice. The summer toilets and bathroom modules too were cleared of immense snow that had accumulated in them. Rewiring of the electric cables in the summer huts and Toilets was carried out. A proper water point was established so that new team members are able to utilize the water in a better and easier way.

**Sewage Water Disposal:** The daily sewage after Klargest action is led out into the wastewater ponds adjacent to the station. With the onset of summer the melting ice from the surroundings also feeds water into this pond at a very large rate. In the event of this pond getting full the overflowing water will flow directly into the Priyadarshini Lake, from where the daily potable water is pumped to the station. It is a challenge in itself to maintain the level of the pond. The water hence is discharged almost as a daily routine to a lake, which is about 250m away. By doing this we have been successful in avoiding any spillage from the sewage pond in areas adjoining the Maitri station.

**Environmental Clearing:** In order to maintain a clean and healthy environment around the station, and to try and achieve perfection in the Environmental protocol-as applicable to Antarctic Wintering Stations, tremendous efforts were put in, to collect all kinds of trash, garbage that has been lying around Maitri. Two full shipping containers of trash was collected from the Maitri area. In addition almost 4 tons of ash that has been lying in the half bins was collected manually and back loaded.

## **Recommendations**

Based on the Experience gained during the Wintering in Antarctica the Army logistic team has the following recommendations to make.

- The clothing that is procured for the expedition members should be of correct size and there should be no compromise on quality.
- The working overalls /Dungarees, Hand gloves etc, should be of Helly-Hansen make, which are found to be most suitable, practical and comfortable to work in the extreme cold climate prevailing in Antarctica.
- The Pisten Bully 270 vehicles should be phased out, due to their vintage nature. These vehicles have practically outlived their life and have already been overhauled once. They are now highly defect prone and need to replace with new fleet of PB-330 or any better version so that the station logistic does not suffer.
- All these vehicles are state of art type, and the members are not exposed much, to these on mainland. Hence experts from M/s Kassbohrer, should impart proper formal training to the members at the firm.
- Any new equipment that is inducted into Maitri, should be sent along with proper, legible, technical support literature in English language viz: Workshop repair Manual, Owner/user manual, Illustrated Spares parts catalogue etc.
- The Workshop facilities at Maitri need to be improved so as to try and provide sufficient heated and warm working space, which enables mechanics to work comfortably even in extreme cold climates. A higher capacity generator of @125KVA, be procured separately for the workshop which should be able to run good blowers and other power tools when working in the shed.
- The "Banjara" module is the backbone of the convoy. It has now outlived its life, as the wooden panels have now loosened out causing ingress of cold air and snow during blizzards that are quite common when in field. A new, better designed replacement should be procured and sent so that Convoys are able to sustain the extreme cold temperatures.
- The equipment that is backloaded for base repairs like Pumps, alternators should be sent back to Maitri, at the earliest having been duly repaired.



*Fig. 8: A View of Indian Antarctic station 'Maitri'*



*Fig. 9: A View of summer hut area.*



## **Conclusions**

The Army Team of the XXth Indian Antarctic Expedition has made an endeavor to provide high quality logistic support to the expedition and the 17th WOT. It was our aim, to complete all assigned tasks and also execute some on our own additionally so as to give a facelift to this pride MAITRI (Fig. 8), the Indian Antarctic Station on the continent of superlatives. The successful completion of the tasks goes to the immense team spirit, cohesiveness and hard work put in by each member of the Army Team. The Army Team, would also like to put on record the assistance, co-operation extended by each and every other member of the team especially our logistic counterparts from DEAL, and both Doctors from ITBP, and our Cook from ITBP, who stood shoulder to shoulder with us during arduous times.

Finally we are extremely grateful and specially indebted to our Leader and Station Commander, of XX IAE, whose co-operation, guidance and support in all our ventures has been mainly instrumental in ensuring successful completion of the expedition on a very happy and satisfying note.

**LIST OF ARMY TEAM MEMBERS SHOWING THEIR  
ASSIGNED DUTY**

(a) Maj Atul Apte	- OIC Army Team
(b) Capt Sachin Oka	- Station Engineer
<b>Corps of Engineers:</b>	
(c) Sub/Ftr C Jayachandran	- Senior JCO& Boiler Room I/C
(d) Sub / OEM M Gowthaman	- Dozer Operator & Fuel I/C
(e) LHav / C&J Tejveer	- Station Carpenter
(f) Nk/ Elect Laxman Singh	- Station Electrician
<b>Corps of EME:</b>	
(g) Nb/Sub (Tech /Elect) Ashok Kumar	- Clothing I/C, Chief Convoy Electrician
(h) Nb/ Sub (Tech B Veh) Jaiveer Singh	- Convoy JCO and Chief Veh. Mechanic
(j) Nb/Sub (Tech /Elect) GNB Rao	- Convoy Electrician
(k) Hav (B Veh) RL Prasad	- Vehicle Mechanic, Store I/C
(l) Hav (EE Mech) Narender Singh	- Generator Room I/C
(m) Hav (EE Mech) Ramesh Kumar	- Crane Operator and Vehicle Mechanic
(n) Nk (B Veh) Ranbeer Singh	- Vehicle Mechanic, Convoy stores I/C

## Appendix B

DETAILS OF CONVOY OPERATIONS DURING THE 20<sup>th</sup> IAE

Sr No	Period of convoy	Load carried	Remarks
1.	01 Mar 01 to 04 Mar 01	01 x Backloading Container 01 x Food items 01 x Boiler room spares 01 x Generator spares 01 x Half bin - Vehicle spares 01 x Half bin - FOL drums, lubes for equipment	Joint convoy items to be back loaded to NCAOR  Station stores for 20 <sup>th</sup> IAE Area at barrel 88, highly Crevasse prone, water Channels not yet frozen.
2.	09 Mar 01- 11Mar 01	01 x LPG Container 03 x ATF Containers (14 kleach) 01 x Food items 01 x Station stores	Empty cylinders for back loading Maitri items
3.	16 Mar01- 23 Mar01	03 x ATF (14 kleach) 01 x Station stores	<b>Blizzard encountered at Shelf and Dakshin Gangotri</b>
4.	28 Mar 01- 30 Mar 01	03 x ATF (14kl each) 01 x IMD equipment container	Maitri items
5.	09 Apr 01 - 11 Apr 01	03 x ATF (14 Kl. each) 01 x 12 Kl (ATF) 01 x LPG	Container

## GPS COORDINATES OF CONVOY ROUTE POINTS

SI No	Point Number	Southings	Easting
1	Shelf	69° 56.374'	11° 56.490'
2	D1	69° 58.523'	12° 00.710'
3	D2	69° 59.112'	12° 01.455'
4	D3	69° 59.598'	12° 01.818'
5	D4	70° 00.060'	12° 01.722'
6	D5	70° 00.671'	12° 01.659'
7	DG	70° 00.720'	12° 01.658'
8	D6	70° 01.161'	12° 01.551'
9	D7	70° 01.693'	12° 01.432'
10	D8	70° 03.511'	12° 00.980'
11	D9	70° 03.977'	12° 00.890'
12	D10	70° 04.272'	12° 00.583'
13	GSI 16	70° 04.721'	12° 00.332'
14	M1	70° 05.386'	12° 01.256'
15	Brl3	70° 06.063'	12° 03.357'
16	M2	70° 06.890'	12° 03.695'
17	Russian Junction	70° 07.136'	12° 04.122'
18	M3	70° 08.067'	12° 05.536'
19	M4	70° 09.016'	12° 07.205'
20	M5	70° 10.646'	12° 09.806'
21	M6	70° 11.810'	12° 11.497'
22	M7	70° 13.021'	12° 12.926'
23	Brl13	70° 13.852'	12° 14.552'
24	Brl17	70° 16.851'	12° 19.472'
25	M8	70° 17.406'	12° 19.087'
26	M9	70° 18.627'	12° 19.200'
27	Brl19	70° 18.922'	12° 19.331'
28	M10	70° 19.836'	12° 19.280'
29	M11	70° 20.192'	12° 19.232'
30	M12	70° 21.309'	12° 19.048'
31	M13	70° 22.600'	12° 18.694'
32	Brl25	70° 22.931'	12° 19.328'
33	M14	70° 23.673'	12° 18.142'

(Contd.)

## Appendix C

GPS COORDINATES OF CONVOY ROUTE POINTS (*Contd.*)

Sl No	Point Number	Southing	Easting
34	M15	70° 24.314'	12° 18.147'
35	M16	70° 24.803'	12° 18.261'
36	M17	70° 26.936'	12° 20.243'
37	M18	70° 30.432'	12° 19.649'
38	M19	70° 31.849'	12° 21.502'
39	M20	70° 32.451'	12° 22.737'
40	Brl47	70° 33.462'	12° 25.014'
41	Brl53	70° 35.089'	12° 30.406'
42	Brl62	70° 38.349'	12° 32.288'
43	M21	70° 39.358'	12° 31.384'
44	Brl71	70° 41.909'	12° 33.441'
45	Brl81	70° 44.919'	12° 30.296'
46	Brl 88 Tank 20Kl	70° 46.667'	12° 26.162'
47	Brl 98	70° 48.810'	12° 23.309'
48	Brl104	70° 50.419'	12° 18.530'
49	Brl 108	70° 51.190'	12° 17.143'
50	Brl 116	70° 53.101'	12° 07.378'
51	Brl119	70° 52.811'	12° 03.507'
52	Brl133	70° 50.263'	11° 51.117'
53	Novo Junction	70° 48.938'	11° 45.257'
54	Brl144	70° 48.803'	11° 46.477'
55	Sankalp	70° 47.914'	11° 44.277'
56	Brl 161	70° 46.024'	11° 38.407'
57	Doser	70° 46.088'	11° 42.241'
58	Maitri	70° 45.858'	11° 44.043'