

XIV Indian Antarctic Expedition

XII Winter Report

NINAD P DESHMUKH
R&DE (Engineers), DRDO, Pune-411015

Abstract

The report contains brief about the scientific, logistic and support activities during the XIV Indian Antarctic Expedition (Dec 94 to Mar 96).

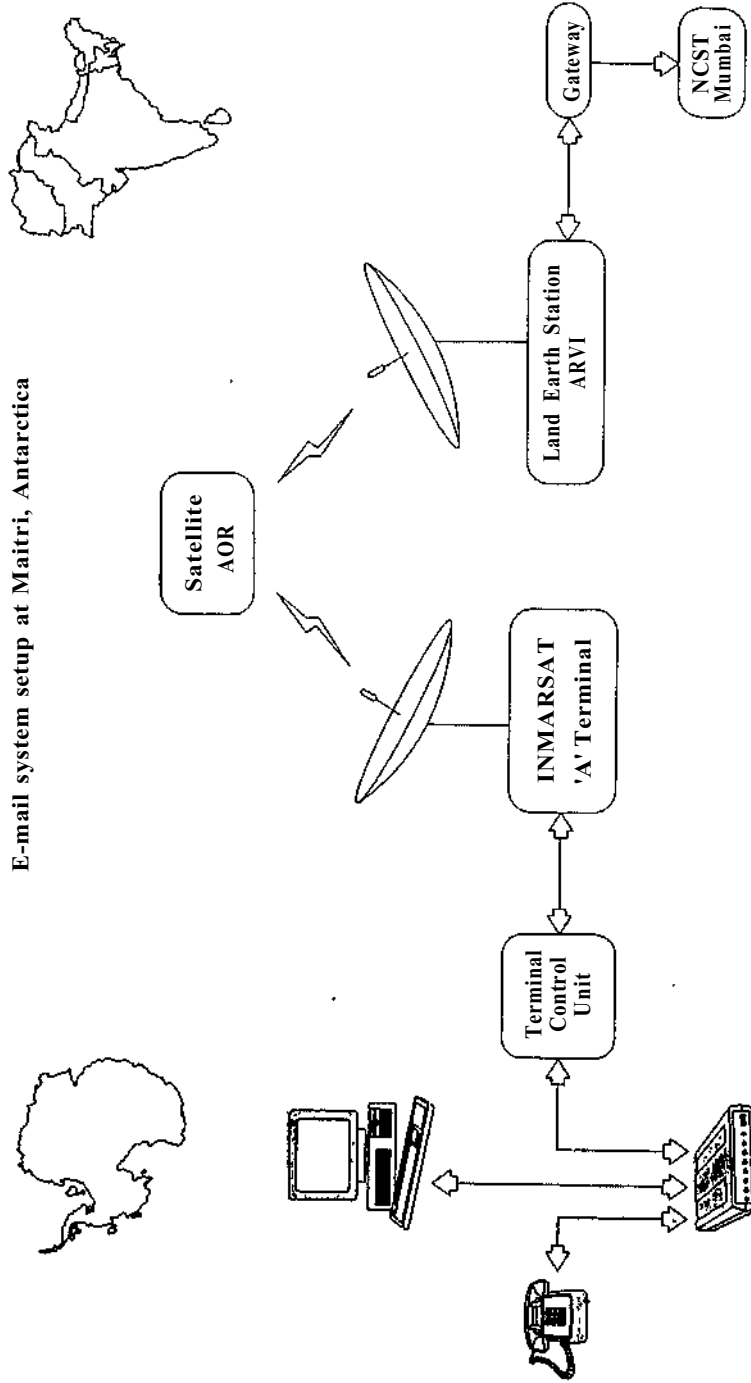
Introduction & Installation of E-mail

Alongwith the various life-support systems required for survival and carrying out various activities at Antarctica, the communication system also forms one of the essential elements. The need for reliable and fast communication was felt right from the first Antarctic expedition. The remote, icy continent of Antarctica apart from having the windiest and cold working conditions; also challenges the communication engineers with magnetic storms, static electricity, earthing problems and heavy magnetic fields. Various communication systems were used/tried to meet the requirements of the expeditions during past. These are;

- i. High Frequency Morse/Voice communication : This is mainly used for communication between India and Antarctica, with other stations at Antarctica and to maintain communication with the ship during voyage.
- ii. Telephone, Telex & Fax through Satellite link.
- iii. VHF communication : Used for camp area, convoys and air traffic control.

Each system has its own advantages and disadvantages with respect to reliability, portability and cost. Many scientific activities involve collection and processing of data and as the Indian Antarctic programme progressed, various scientific activities were taken up. The need for the data communication was felt strongly. Also it was required to exchange the data between the parent organisation as well as with other stations in Antarctica which were having the

E-mail system setup at Maitri, Antarctica



similar scientific programme. Hence it was proposed by R & DE (Engrs) to install the Electronic-mail (E-mail) to have the global communication.

On the E-mail network apart from meeting the above requirement, various activities like transfer of structural drawings, exchange of information/letters, transfer of pictures etc. are also possible. In fact, the E-mail system puts you on the information highway.

In case of postal mail service, the transfer of mail from sender to receiver is via area post office similarly in case of E-mail, the transfer of mail from domain to domain is via host.

The E-mail system at Maitri mainly consists of:

INMARSAT (International Maritime Satellite) Space Segment:

The INMARSAT organisation has got four equatorial satellites as mentioned below :

Atlantic Ocean Region (AOR) - East

Atlantic Ocean Region (AOR) - West

Pacific Ocean Region (POR)

Indian Ocean Region (IOR)

These satellites are interlinked to provide the global communication. We are using the link with a satellite in the Indian Ocean region with a Land Earth Station at ARVI (a place near to Pune). The INMARSAT A terminal has a uplink frequency of 1.6 GHz and downlink of 1.5 GHz. The terminal uses a dome which contains a parabolic dish antenna of 4 feet dia. Antenna is controlled for its orientation (elevation and azimuth) by software and has a autotracking facility to ensure the reliable link with the satellite. The frequencies used for uplinking and downlinking are unaffected by the atmospheric changes and hence guarantees a reliable communication at all times.

INMARSAT terminal: MTI (Mobile Telesystem INC.) make, MCS-9120 model, INMARSAT A terminal is basically used to provide the necessary telephone line required for E-mail. This terminal can also support Telex and Fax in addition to telephone facility (provided the system is configured for Dual ID). This terminal can also transmit the DISTRESS CALL to Rescue Co-ordination Centre in case of eventuality. This was another reason to install E-mail outside Maitri station.

MODEM : MODEM forms an essential interface between the digital link from the PC and the analog telephone line. The MOTOROLA make FasTalk-II modem is used which can automatically adjust the baud rate depending upon the line conditions and provide error correction to ensure error free and the fast data communication.

Computer system : Waffle (Ver 1.65) and Pegasus-mail (ver 3.22) were used for the E-mail. As mentioned above the flow of electronic mail is almost similar to that of postal mail service, the E-mail node at Maitri uses a host at National Centre for Software Technology (NCST), Bombay. Mails to Maitri node can be sent on following E-mail address; root@maitri.ernet.in

The E-mail was installed at Maitri on ERNET (Educational & Research NET work) in January 95. After sharing the experiences with earlier winter team and considering the safety aspect, a site was selected at the summer camp area. The system was basically installed outside the Maitri station as the INMARSAT terminal used for E-mail can be useful as a standby for telephone in case Maitri station faces some eventuality like fire. The wind direction and the snow accumulation near the selected site was also considered. The system was installed in a vacant summer hut made of Hialtech structure. The structure was named as GIRNAR.



During the entire year (Jan 95 - Feb 96) about 1200 E-mails were sent to various organisations and other foreign stations. More than 1400 E-mails were also received at Maitri. The mails to/from maitri also contained exchange of scientific data, data- bases, structural drawings, softwares and welfare messages of expedition members. The news items were also received from US based news network and some of the Indian bulletin board systems which were displayed on the the notice board of Maitri station under the heading EYE IN THE SKY,

which kept the expedition members in constant touch with motherland. It also helped in reducing the feeling of isolation at this remote continent.

As this was the first year when E-mail was installed there were many things which were carried out so as to ensure the smooth working condition.

It was required to fix up a blizzard rope between Maitri station and E-mail hut so as to help approaching the Girnar during polar nights and blizzards.

Three phase power supply connection was laid from Maitri to E- mail hut.

The delicate E-mail system components were connected through a voltage stabiliser on one phase, room lighting and bipolar ionizer was connected on another phase and two hot air blowers were connected through digital temperature indicator and controller on remaining phase. This was done basically to balance the load.

The Hialtech structure needed the sealing at all joints as the heavy snow accumulation was observed after the first bilzzard. All the joints and leakages were sealed with adhesive type of silicon sealant. Even after sealing of all the wall and roof panels, the temperature inside the hut was quite low (upto -15 degree C) so the hot air blowers were used. It was required to operate these blowers manually to maintain the temperature of +20 degree C hence a temp. indicator and controller was commissioned.

The flooring of the hut was becoming quite cold hence the floor was covered with Styrofoam and a coir matting was placed above this. This improved the inside temperature significantly.

The entire power cable from Maitri to Girnar was conduited to avoid damages due to vehicles and tres-passers.

The bipolar ionizer was installed to reduce the chances of damaging the delicate equipment due to static electricity. The results could not be recorded due to non availability of charge meter, but the improvement was felt.

Many of our expedition members not familiar with the use of PC as they were from different disciplines, for them the user friendly menu driven software for feeding the mails to be sent was developed. Also the programme was developed for collection of mails for dispatch. A register was maintained to help users to know about the status of their mail.

The received messages were sorted out, hard copies were made and distributed to individuals.

During the stay and operation of E-mail certain problems were faced. Some of them are mentioned below:

The software setup of INMARSAT terminal got corrupted and the system started malfunctioning. The fault in the EEPROM of CPU card was rectified and system was re-configured.

The complete system was out of order due the problems in INMARSAT terminal and the PC. The Phase Lock Loop oscillator inside the INMARSAT terminal was not-functioning and it was repaired. The Hard Disk controller of PC went faulty which was replaced. Formatted the hard disk and re-installed the complete software system for E-mail. In the total time period of approx. 400 days the system was down for a period of 16 days.

In one of the blizzards some panels from the green house side fell down and this damaged the power cable from Maitri to Girnar. This was replaced and the cable is now conduited.

Suggestions

1. The INMARSAT A terminal has got a dual ID feature which can be utilised. This will be helpful in having telex and fax facility in addition to the one which is already existing in the station or can be used as a standby.
2. At present the E-mail is connected through ERNET, we can also subscribe for INTERNET which will open one more information highway.
3. The need for the buffer door was projected as during the winter heavy snow accumulation was experienced in front of Girnar.
4. A sodium vapour lamp should be fitted on Girnar hut which will help in approaching during blizzards and polar nights.

Support Activity

Support extended to other institutions

1. *Indian Inst, of Geomagnetism (IIG)*; During the period of XII wintering (Mar 95 - Jan 96) IIG did not have any member to winter-over. They had the on going Multi-Fluxgate Magneto meter experiment. The setup included two analog chart recorders, daily variation (DV) and micropulsation recorder (MPU), Laptop computer, Data logger, Memory module, Printer and Batteries. The nature of work included :

- a. Giving the time stamp MPU and DV recorder everyday.
- b. Replacing the pens and chart of recorders as needed.
- c. Topping up and maintenance of lead-acid batteries of data logger.

Complete data on magnetic activity during the wintering period was collected and setup was maintained including repairs of printer, laptop computer and data logger which was handed over to the IIG member who came with the XV expedition team in Jan 96.

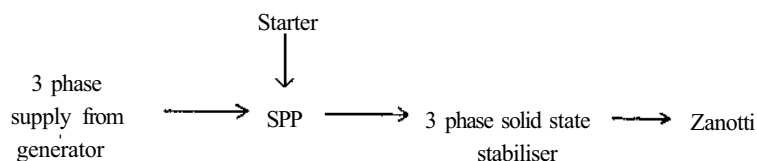
2. *National Physical Laboratory (NPL)*: Ultra-Violet B iometer instrument which was a part of NPL's experiment failed during the onward journey from Goa to Antarctica. This was a US make instrument and the company on the FAX replied to send the equipment for repairs which was difficult and could have delayed the experiment by 16 months more. The repairs were attempted and could rectify the fault. After the repairs required help in setting up a communication software, transferring the data from the memory of instrument to PC and taking printouts was provided.

3. *Defence Electronics and Applications Laboratory (DEAL)* : E-mail system was installed on the 486 PC which XV expedition team brought along with them. The PC was infected with virus and anti-virus software was not available with DEAL team. The virus was removed by me without anti-virus software. It was decided to install E-mail on this 486 PC. The detail training on how to install the E-mail setup, how to operate the system was imparted to DEAL team members.

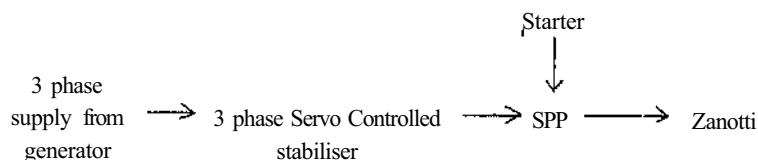
Support extended in the station activities

Installation of walk-in type Deep-Freezer : The walk-in type deep-freezer used for storage of Vegetarian food failed during winter. This was replaced with new Zanotti unit. The following steps were carried out:

1. The three phase voltage stabiliser connected for Zanotti developed the fault in itself and this in turn supplied the high voltage due to which Zanotti unit went faulty. The stabiliser was removed from the circuit. The earlier setup for power supply to zanotti was



The suggested change is



The stabiliser used for the Zanotti should be a Servo Controlled stabiliser instead of solid state stabiliser to avoid the chances of failure due to solid state stabiliser. It should contain output high and output low cut-off essentially since inductive motor of a compressor is likely to damage even due to low voltage.

The position of SPP and stabiliser arc interchanged in the change suggested above to ensure double safety for the costly and important Zanotti unit. SPP has got an inbuilt high and low voltage cut-off setting and also provides the basic single phasing and phase reversal protection.

2. After the faulty stabiliser was removed the SPP also was tested for its proper functioning.
3. The old unit was removed.
4. The pre-installation checks were carried out.
5. The unit was commissioned and sealing of leakages around the Zanotti unit as well as walk-in type module was carried out.
6. Gradually the temp, of-18 deg C was attained and hourly readings were taken to check the proper functioning and auto-defrost cycle.

The XI winter team faced the problem of duct freezing during winter period so this year it was planned to install the automatic duct temperature controller. Earlier duct temperature was controlled manually by means of a starter which switches on/off the circulation of hot water which contains the mixture of mono ethylene glycol as an anti-freeze. It is required to maintain the duct temp. between the specified upper and lower limits. Hence a dual set point temp. controller was used. In manual operation the freezing of duct can mainly occur due to human error involved in switching on the motor or if the temp. of hot water tank decreases. The automatic temp. indicator and controller overcomes these factors and also gives an alarm in time if duct temp. falls below specified limits so that a corrective action can be taken. The temp. controller which was carried with us was received in faulty condition. The IC LM324 and a signal conditioning transistor were found faulty. The required spares were not easily available but were obtained from the other unused electronic gadgets and was repaired. It is installed in the lounge with the idea that it can be easy for a galley duty person to keep a watch. The manual operation of duct motor was also retained to keep the redundancy. The unit was tested for the period of more than four months.

The 486 machine procured by DOD (Wipro make) was having problem with its floppy drives (1.2 MB and 1.44 MB) when it was tested at Antarctic study centre, Goa. The repairs was attempted by Wipro's service engineer but the problem was not rectified. Due to this 486 could not be used for installation of E-mail. Later on the hard disk drive of the same machine became faulty. This

machine is having EISA controller which was repaired, then the floppy drives and the hard disk became functional. This machine also has the cartridge tape drive but the cartridges were not available at Maitri. It is suggested that the complicated configuration for PC's should not be selected for the use as these machines require critical spares and increase the complexity for the repairs.

The LQ-1050 printer was the only printer available during the period of expedition which failed due to the mechanical wear out of the drive gear. The spare gear was not available but could manage to continue by swapping the faulty gear within the gear assembly itself. It was suggested to backload the printer but later on it was decided to keep it back as it is still working. The required gear may be sent with the next expedition team.

The only washing machine which was in working state failed in the month of April 95. The spin dryer was not functioning. There was one more machine of similar make and model which also was not functioning, from that the required capacitor and motor was removed and the machine was repaired.

Medical : During the stay at Antarctica the medical equipments such as ECG, Boyle's apparatus, motor operated suction machine were repaired and assisted doctors in overhauling and maintenance of these machines.

During the operation of Sub Yadav of XV IAE the X-ray developing was done. It is for the information that Boyle's apparatus, one of the essential instrument required during operation was not functioning properly due to non-availability of a washer for oxygen cylinder but this was replaced with a washer made out of 10 ml injection syringe and they could use the instrument.

This year the demands for the next expedition were prepared on computer and database was developed to know about the stock of stores existing at Maitri and the quantity demanded for the next year. Various demands such as medical, vehicle spares, food items, sports, life support systems were prepared and making use of the E-mail facility they were sent to DOD which reduced the expenditure involved in sending the same demands through FAX. The system developed was explained to next team.

The handing taking over note was prepared in dBase and about 500 pages inventory was prepared and two copies were made. Earlier this was made on PC but software like Wordstar was used for this purpose this year using dBase-TV it was made.

Helped in various activities of the station like painting of MI room, lounge, developing of b/w photographs for station activities, preparing first-day cover for mid-winter day, air-force day, certificates for mid-winter day.

A hot water boiler was made using the locally available resources with a auto-cutoff at 85 deg C and water level indication. This was useful for tea and coffee lovers.

The charge of keeping sports, Mandir, Gymnasium, recreation items was maintained.

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