

RADIO COMMUNICATION SUPPORT IN ANTARCTICA

Sanjay Kaushik & Virendra Nautiyala

DEAL, Dehradun.

Abstract

Communication is a vital part of an expedition; it is the link with motherland. This not only keeps the members' morale high but is essential also to pass on the critical scientific data to parent organisations. This paper gives the details of communication provided to the XVII Indian Scientific Expedition to Antarctica and the Facilities at Maitri, Indian permanent Station at Antarctica.

Introduction

Communication system is an essential and vital element for successfully carrying out various activities during the expedition. Apart from remote, windiest and coldest working conditions, magnetic storms, static electric charge and heavy magnetic field are some of the challenging factors encountered by the communication team. Initially till, XIV Expedition, Indian Navy was entrusted with the responsibility to meet the communication requirements of the expedition.

DEAL'S participation in the Indian Antarctic Scientific Program had started in 1991 with a summer member to carry out experiments in HF propagation in VOICE & DATA transmission. From the XV Expedition, in 1995, the DEAL was entrusted with the responsibility of total communication support for the Indian Antarctic Expedition. Along with SCIENTIFIC STUDIES, the DEAL team look over the responsibility from Indian Navy.

Objectives

The main objectives of the DEAL team during 17th IAE were:

1. VHF/HF communication & studies
2. HF Fax reception
3. Scientific data transaction
4. Communication support to convoys.
5. Field camp & helicopter communication.
6. Phone, Fax and Telex services through Satcom Terminal
7. Mobile Satellite Communication for Convoy & Field Camp
8. H.F. Communication with India & Ship
9. Operation of E-Mail, picture transmission and Internet.
10. Maintenance of Satcom terminals and communication systems.

Activities

The XVII Indian Scientific Expedition to Antarctica sailed off from Goa on 8th Dec. 1997, under the leadership of Mr. K. R. Sivan of R&DE (Engrs) Pune. We reached Antarctic coast, Indian bay, on 2nd of Jan 1998 by the chartered vessel MV Polarbird.

During Sea voyage phone/fax facility was provided to the members by DEAL team using the system available onboard ship. We were also maintaining regular HF contact with India and Maitri during voyage. Messages for logistic support and other information were regularly exchanged between ship, Maitri and GSI field camp at Humblodt mountain range. At Mauritius we had received the Inmarsat M terminal which was tested on board. During our sea voyage the first task was to prepare small packages of HF Log Periodic Antenna to shift it from ship to Maitri as an under slung load for helicopter. This job was completed very much in time. All the assigned communication tasks during summer period were carried out successfully with the active support from 14th winter over team.

Field Camp and Helicopter Communication

During summer period, communication using Motorola GP

300 was provided successfully to field camps. During winter Aviation Band VHF Communication was provided to SASE field camp. In summer, the same sets were used for helicopter communication. We could communicate regularly with NOVOLAZAREYASKYA (Russian Station) through out the wintering period with Dittel set at 124 MHz,

VHF Communication Support to convoys

During summer total communication for DG, Ship and summer camps in Schirmacher Oasis was provided with the help of VHF repeater. The repeater was installed at Vettiyya hills about 10km away from Maitri. The problem faced was to keep the battery in full charge since the solar panel that provided for this purpose was not enough. As a trial, a windmill of 500W brought by NAL was erected to charge the battery. The repeaters were damaged due to high voltage from the unregulated supply of the wind mill and also due to the snow during blizzards. The problem faced was to eliminate the overcharging, since there was no facility provided with the system. Proper Shelter for the Repeater could not be made as yet. Two repeaters were brought with XVII IAE and old repeaters lying in Maitri were repaired and used during summer period but all became defective. There was no repeater available for the entire winter period. It was a challenging task for DEAL team to provide communication to the convoys without a repeater.

The frequency programming of all the VHF sets was modified to operate in the absence of repeater. The distance of the convoy route from Maitri to ice shelf, India Bay, is about 150km. During the 1st convoy, we could achieve the best inter convoy communication. All the convoy vehicles were in good contact with Maitri upto Sankalp point. But between Sankalp point and Nunatek we could monitor them one or two times. After Nunatek all the convoy vehicles were once again in good contact with Maitri. In the absence of repeater, we also tried to improve the communication range after DG towards shelf by erecting a 75 feet mast at Maitri but we could not achieve any significant gain from it.

The Russian convoy team was not in communication with NOVO from 17th June. On the request of Russian leader, Indian

convoy team rescued the Russian team members on 20th June 1998. During this search/rescue operation, very effective VHP communication was provided to our convoy team.

VHF communication at 124 MHz was maintained throughout the wintering period with the neighboring Russian station.

HF Communication

At Maitri two 14-30 MHz LPA for long haul communication were installed by previous teams but to improve short haul communication during summer period we assembled, erected and tested a new 6 to 30 MHz, HF LPA. One Yeasu FT-767 with a 500W linear amplifier FL-700 were used for HF communication with India.

HF Communication with India was quite satisfactory upto 22 May 1998 but no communication was possible during winter due to various factors such as magnetic storms, blizzards, static electric charge, local disturbances and propagations. But since 25th of July we were able to monitor Vividh Bharati News at 10.33 MHz occasionally. Once again we could start HF communication with India wef 19th of Aug 1998 and it started improving day by day. HF facility was also extended to the other team members who were interested to talk on HF with their families. It was observed that 17423 kHz U.S.B. was most suitable frequency after winter period.

Weather FAX Reception by HF.

In Antarctica weather is the most important phenomenon to be considered before planning any work because the bad weather suddenly hamper the work. HF weather faxes were received whenever the propagation conditions were suitable. This weather fax transmission service is being operated from Pretoria on 13540, 18240 KHz at 04.45, 08.00, 10.00, 15.00 and 22.00 UTC. Because the chart is transmitted on HF, availability/nonavailability and quality of the weather chart depends on propagation conditions. This weather chart also helps the communication team because it was observed that during blizzard and bad weather, satellite communication is also affected upto some extent and as the wind

speed increases the static-charge becomes more intense in winter.

Scientific Data Transmission

Scientific data of following participating organisations were regularly transmitted in compressed form using the e'mail and whenever the system was not functional, same were transmitted by FAX.

- a) Data on 3 component seismological and global positioning system to NGRI, HYDERABAD.
- b) Recording of Global UV-B radiation at different wave length to NPL, NEW DELHI.
- c) Data on health monitoring of generating sets to R&DE (Engrs) PUNE.
- d) Data for geomagnetic field variation to IIG Mumbai.
- e) Monthly weather summery data to IMD New Delhi and daily IMD data transmission on Telex.

We had also received the scientific data from NGRI, Hyderabad a number of times to assist the work of NGRI scientist.

Telephone / Fax and Telex Facility

Telephone/fax and telex facility were provided through Inmarsat A terminal. Throughout the period of expedition, we could provide uninterrupted and round the clock phone/fax and telex facility to the team members. Telex was used only for sending IMD data. The main Satcom terminal became defective on 5th Sep. 98 but the system could be restored on 8th Sep. 98. During above mentioned period, alternate arrangements were made on E-mail terminal to provide uninterrupted phone/fax facility. Total 2403 number of phone and fax calls were matured up to March 99. Ninety percent Fax were transmitted on Max. 9.6 K baud rate. Total 1665 number of IMD Telex was transmitted.

Mobile Satellite Communication for Convoy & Field Camp

Inmarsat M terminal was deployed for GSI field camp at Humboldt mountain for the first time where VHF communication is not possible due to the absence of line of sight, long distance and the terrain condition. HF communication was found ineffective because of propagation conditions. Inmarsat M terminal was used during summer of XVII IAE and found to be the ideal solution for communication in field camps

The same terminal was effectively used during convoys to have communication from DG and ice shelf to Maitri. In the month of June after disaster of Russian helicopter, within a short notice all the VHF sets were checked for proper functioning and were made available, along with Inmarsat-M terminal to the convoy team. After barrel number 6 (near D.G.) the Russian convoy route diverts left and we do not know the terrain of that area. Our convoy team could communicate with Maitri only by using this system from the Russian barrier (shelf).

Both the members from DEAL participated in first and second convoy to observe/study the communication problems encountered during convoys and to provide trouble free communication to convoy team.

Operation of e-mail, Picture Transmission and Internet

Inmarsat-A satellite terminal Magnavox MX2400 was commissioned during summer for exclusive e-mail and Internet access. Eudora-pro software is being used for e-mail. The complete system is installed in one of the modified summer huts. We had tried for remote operation of e-mail terminal from Maitri but during the winter problem of noise on the line due to static charge became prominent and it was very difficult to access VSNL, so the e-mail system was maintained and operated from e-mail hut.

During our wintering period, e-mails could be sent/received regularly. However there were two interruptions, from 30 March to 5th May 98 and 12 Oct. to 29th Nov. 98, when the account was

retired and restoration got delayed due to administrative reasons. Due to limitation in allocation of time, real time picture transmission and internet were not tried regularly but the picture on compressed file were sent on as a trial basis and could be successfully transmitted. Total 3992 mails were sent and 4204 mails were down loaded during 15 Jan. 98 to 31 Jan. 99.

e-mail was found to be the best and easy method to transmit large data file in compressed form and also for sending/receiving personal messages.

Conclusion

The team from DEAL have provided effective communication through out the period of expedition within the resources available. The communication for the convoys is to be improved. Without a repeater, it was found to be difficult to provide trouble-free communication between Maitri, ship and helicopter sorties. The Inmarsat M terminal was found to be effective and suitable for field parties/convoys and is required in more numbers, since in summer, there used to be five to six field camps operative at a time and HF cannot be relied due to its limitations. For Inmarsat M terminal operation, clear weather conditions are required. In winter, during snow drift and blizzards, strong static charge is formed and cause concern for operating the communication equipments. HF communication is also not feasible during this period.

Acknowledgements

We are thankful to Dr. A. S. Bains, Director, DEAL for sponsoring us and giving a chance to participate in XVII IAE. We are grateful to ASC/DOD for giving all the support to carry out the proper communication. Nothing could have been possible without the valuable guidance provided by the Antarctica Task Force of DEAL and we are thankful to them. Last but not the least the encouragement and all the support given by the logistics team, fellow expeditioners and the leader is unforgettable and we owe them for our success.