

Communication Report — XII Wintering

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Introduction

1. This report covers communications related work done during period from 01 Feb' 95 to 31 Jan' 96. The report aims to highlight the major events as well as offers suggestions for further improvement in future.

Personnel

2. The following comprised the communication team.

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|--------------------------|-----------------------|
| (a) Lt Vikas Dhasmana | Communication Officer |
| (b) S.S. Yadav CHELR | Radio Electrician |
| (c) H.S. Chauhan PO(Tel) | Telegraphist |

HF Communication

HF Link with New Delhi

3. The Traffic between Maitri and Dept. of Ocean Development (DOD), Army Signal Centre was handled by HF circuit between Maitri and Comcen Delhi.

4. HF link worked satisfactorily and was able to fulfill the requirements of expedition. While the overall performance of the link was satisfactory, however the day to day performance depended upon the Geomagnetic and Ionospheric propagation conditions. The propagation conditions were poor from May to My' 95 and from Sep to early Oct' 95 and during days of heavy magnetic activities. Apart from propagation and geomagnetic conditions, blizzards, strong winds and heavy snowfall with wind also affected the HF communication due to heavy build up of static charge which even caused damage to HF receivers. The details of contacts as follows:

- (a) Total number of no contact days - 63
- (b) Total number of poor contact days - 22

5. All the no contact and poor contact days were during polar nights. The other poor contact days were spread during the rest of the period. The main reason of these unsatisfactory condition were:

- (a) Poor ionospheric conditions
- (b) Geomagnetic disturbances
- (c) High-static build up

6. The details of magnetic activity was taken from IIG equipment kept in summer hut. Since magnetic disturbance and magnetic storms are very often in polar regions and continuous absence of sun during polar nights causes a change in electron concentration hence a change in ionospheric condition is observed. Hence it is definite that HF communication is not, as it is in the rest of the world.

7. The traffic was of routine nature and was cleared within 24 hrs except when the delay was more due to poor link.

Traffic Pattern

8. Most of the traffic was private in nature from members for their families and vice versa. This traffic was handled on HF. The official message from Maitri to NHQ, DOD, IMD, Army Headquarters via Army Signal Centre was passed on HF. However most of the traffic to DOD was handled on Fax at the discretion of the leader.

9. With the commissioning of E-mail facility at Maitri from Mar' 95 onwards the load on HF communication was reduced and only at times when E-mail link was down the traffic on HF link increased.

Personal Messages

10. Personal messages formed the bulk of traffic handled. The out traffic of personal messages was more than that it was responded by the relatives and friends of members. It was also observed that DOD is prompt in posting the messages to the destination.

Cost Saving

11. A total of 478 messages were handled on HF. This includes messages from Maitri to DOD/NHQ/Army Signal Centre and messages from AHQ/Air HQs/DOD/NHQ to Maitri. The total traffic handled 33300 words. If the same were to be transmitted on Satcom the cost would have worked out to a heavy amount. Apart from DOD/NHQ, messages were also exchanged between MV POLAR BIRD and Maitri on her return Voyage to India in March' 95.

Satellite Communications

12. Two Inmarsat Terminals are available at Maitri Station to link Maitri with rest of the world by satellite. This is mainly used to send/receive official Telex messages as well as private/official Fax and Phone messages. Fax is popular among expedition members as it sends their handwritten letters to their families. The time utilised is counted towards individual's personal telephone time. The second MTI Inmarsat Terminal Commissioned last year is totally dedicated for E-mail facility. The new terminal is not provided with any Fax/Telex attachment.

13. Two Satcom terminals in Maitri were lying non-operational since May' 92 for the want of spares, however both terminals are being backloaded to India as per DOD's orders since both are beyond local repairs.

14. Weather data from Maitri was collected by the India Meteorological Department (IMD), Delhi at 0015, 0615, 1215 and 1815 hrs (UTC) daily on TLX. The line was connected by IMD office at Delhi.

15. The satellite terminal worked satisfactorily except on occasions the satellite antenna gets unlocked, presumably, due to low temperatures and high velocity winds. There is no access hatch for the dome to put heaters or in case of any breakdown to do any repairs. This problem was explained to the Station Commander in the month of March' 95, however till todate has yielded no positive results, hence the job remains pending and is handed over to the next team.

16. The facsimilie (FAX) machine became non operational on 18th June but was repaired the same day. An inductor was found to be burnt. Again on 19th June' 95 the machine became non-operational. This time the machine was put back to operation on 21st June' 95. The fault was localised in the power supply unit. Later the machine was tested with DOD by sending and receiving Fax.

Convoy Communications

17. Communication was provided for all convoys conducted by the EME Team from Feb'95 to Oct'95. In Feb'95 two VHF Dittels sets were fitted in two vehicles. The height of the antenna fitted in one of the vehicle was increased in order to provide communication to a longer distance. Sets became non operational on and'off during convoys but were repaired at very first opportunity on return of the Convoys: Out of 04 VHF Dittel sets, one set remains beyond local repairs. At all times during convoy it was the endeavour of Communication Team to provide two VHF Dittel sets to the Convoy vehicles. The range of Dittel set is more than 200 nautical miles but due to antenna height, Radio

Horizon range is limited to only around 2/3 of the convoy route, beyond this range Maitri is not able to communicate. However the convoy vehicles have communicated with Russian station Novolazerskaya from barrel number 25. A suggestion regarding installing of VHF Repeater at any hill of height above 520 mts was given by the previous communication team, with this Maitri would be able to cover the entire Convoy route by VHF till India Bay.

The HF communication between convoy vehicles has not been found to be effective due following:

- (a) Absence of HF ground wave on ice surface.
- (b) Maitri is situated in a valley and no suitable directional antenna is available at the station.
- (c) Day to day change in Ionospheric conditions and frequent magnetic storms.

18. XIV Expedition has transported most of the stores from India Bay to Maitri by land convoys. In order to provide effective communication between convoy vehicles new hand held Walkie-Talkie (Tackphone) sets were provided to all convoy vehicles. This setup however increased the effectiveness of Intra Convoy Communication. The ranges obtained by these sets were of the order 1.0 to 1.5 Kms. Another drawback was that of quick drain out of batteries due to extreme negative temperatures, hence the sets required a change of battery every 24 to 26 hrs.

Camp Communication

19. Only DG camp was set up by IIG, Bombay. Communication between DG and ship was satisfactory. A new inverted V antenna was installed on top of Portacabin at DG. However trials carried out with RF 2301 HF TX/RX set in the month of April' 95 proved to be unsuccessful. The antenna tuning motor failed to turn due very low temperatures, hence the set could not be tuned properly. The power supply inside Portacabin was erratic and more over there was no provision of providing continuous power supply for longer duration. Further trials were abandoned.

Communication with Neighbouring Stations

20. Communication with neighbouring stations Novalazarevskaya, Geo Maud Camp and Georg Forster was very good. A continuous watch was kept on 122 MHz and 5400 KHz and these stations/camp could be contacted round the clock. Contact with Russian Station Molodozynaya was made on as and when required basis. Occasional contacts were also made with other stations however

due readability on low power HF was only strength 1 to 2, Therefore scientific data could not be exchanged on this network however Japanese station "Svowa" and German Station "Neu mayer" exchanged data through Fax or Telex. On the occasion on Antarctic Mid Winter Day, greetings were received from many Antarctic Stations and the same were also responded back by Fax/Telex.

Short Range Communication

21. Short range communication between Maitri and MV Polar Bird at India Bay was satisfactory, however with DG the same was unsatisfactory. At times it was difficult to contact the ship or DG over HF due to poor propagation conditions and lack of directional antenna. DG and Maitri are having locally fabricated inverted V/Dipole antenna which does not transmit full power of transmitter in desired direction, thus having limited range of communication by HF in Antarctic conditions.

Experiments on Data Modems (DCT's)

22. Trials carried out on Data Modems did not prove to be successful because most of the times during CW transmission "Word Twice Procedure" is used and transmission with the help of data modems was always repeated as it was either not received at Delhi or with lot of interference and that too garbled. Hence message Transmission with the help of DCT's was abandoned and manual keying was resorted to.

23. Reception with the help of DCT's too was not satisfactory, as most of the time Maitri receives Delhi at the most QRK2 and during very good Ionospheric QRK 3. When data modem were put in reception mode the messages were either not received or few alphabets were printed on the paper. It is pertinent to mention that for DCT's to work effectively the signal strength should be more than QRK 3 and that too without interference, which is not the case in Antarctica where there is always lot interference due to magnetic storm, heavy built up of Static Charge or poor Ionospheric conditions.

Problems in Communication

Static Noise

23 Maitri has numerous metallic objects and riggings etc. in its vicinity. The station building also has metallic cladding in some places. All these metallic objects tend to acquire static charge and cause radio noise. This problem is made worse due to wooden building structure which is non conductive and provides

an absence of electric ground for the station. This results in malfunctions of sensitive radio equipments. It has also been observed that in presence of static charges other Scientific equipment also get affected and malfunction. On many occasion the equipment gets damaged also. Therefore to ensure noise free communication and better upkeep of sensitive and costly equipment a proper radio ground is necessary. It is recommended that a separate grounding should be considered for radio equipments. The maximum affect of static charge has been felt during Polar nights/blizzards and heavy snowfall.

Radio Aerials

24. At Maitri we do not have proper antenna system except for a Rhombic Antenna for high power transmission. All other transmitting and receiving aerials are make shift and do not work at their peak efficiency. It was observed that even after radiating 4.8 KW of power, Delhi receives QRK 2/3 whereas Delhi radiating only 2 to 3 KW gives QRK 2/3 at Maitri. On studying the 5KW system the following were observed:

- (a) Upper level height of radiating elements of Rhombic Aerial are unequal. Since the terrain on which the Masts are installed is uneven hence this causes the difference in the upper level height of radiating elements. This might be causing an improper radiation pattern.
- (b) The Rhombic masts are installed in a valley and the height of masts is short. It is recommended that masts of greater height are installed, like the one installed at Russian Station Novolazaraskya.
- (c) Presently 5KW Txr are installed inside the main station building and initially were having a feeder cable of 50 mts approximately and there after a transmission line of about 90 mts. Since this transmission line was not levelled and was causing loss of power. A new feeder cable was made by joining two lengths of cable available in the station and reinstalled in the month of Sept 95. This new installation has been able to reduce the power loss as now Delhi receives Maitri QRK 2/3 with 3 KW of power output.
- (d) Since no dummy load is available at Maitri the power output of 5 KW could not be measured at —
 - (i) End of feeder cable
 - (ii) Soon after balun transformer
 - (iii) At terminal load resistor.

Since no details were available, its power losses due to all above factors could not be ascertained. Provision of a dummy load and wattmeter would have been of immense use during the expedition.

(e) A major handicap at Maitri is proper receiving antenna. Since no proper aerial is available, Maitri is using makeshift arrangements for reception by use of inverted V antenna installed at Maitri station main building.

(f) No suitable antenna system is available for low power transmission. Lot of problems were faced during summer as well as winter to communicate with ship, DG and other neighbouring stations of Maitri. Since any amount of sophistication and power output of a Txr will not be of any use unless a proper antenna system is installed like LPA/YAGI/OPTICAL QUAD etc.

(g) Communication was not tried with DG during winter season as convoys never halted at DG. However in the month of April 95 a new inverted V antenna was installed on top of Portacabin. A 125 watt HF Tx/Rx (RF 2301) was taken for trials during one of the Convoys. However trials were abandoned due to non availability of proper stable power supply and secondly due jamming of ATU motor due extreme low temperatures. It is pertinent to mention that RF 2301 HF Tx/Rx is designed to work uptill only -10 deg celsius.

(h) Two VHF aeriels are installed in Maitri main building and with their present height their RHR covers about 2/3 of the Convoy route. However a proposal remains pending regarding increasing the height of the aeriels so that more communication ranges could be obtained. However nothing much has been done till todote.

Mutual Interference

25. The equipment density in Radio Room is high. This small room has a 1 KW transmitter, 03 HF Receivers, 02 VHF Receivers, 02 Data modems, Satcom Terminal, VDU with Fax and Tlx machine and also located within 5 metres of Radio Room are two 5KW HF Txr. All these causes mutual interference hence more space is required for Radio equipments.

Equipment and Spares

Equipment Availability

26. The availability of equipment has been satisfactory, however no proper antennas are available for receivers as well as low power HF Transmitters. Long range Walkie-Talkies were demanded however the ones received were having ranges between 1 to 1.5 Kms.

Spares

27. The availability of spares has been inadequate for high power HF TX RF 727(5KW). No usable spares were held at station for this TXR. It is pertinent to mention that no spares were provided by DOD for this system inspite of repeated reminders by all communication officers since last 3 years. Even critical spares for supporting this link were not provided by DOD. On 03 April Txr no. 1 became non operational and PA Bias Unit transistor 2N6283 was found to be burnt. Since no spare transistor was available hence the Transmitter could not be repaired. On 5 th June Txr no. 2 also became non operational however the same was repaired by 08 July after cannibalising items from Set no. 1 but the power output of the set remained restricted to 4.5 KW. Set no. 1 was also repaired by repairing old processor card assembly and by modifying the circuit of PA Bias Unit. Since then both the transmitter worked satisfactorily however the power o/p of Set no. 2 remained restricted to 4.5 KW due to non availability of required spare. Spares of other systems are adequate to handle any break down.

Repairs

28. The communication team had excellent expertise in repairs, maintenance and installation of all communication systems be it VHF or HF sets. Even repairs to Fax machine were successfully carried out inspite of non availability of its service manual/technical manual. Repairs to non communication equipment like TV, music systems intercom system and photocopying machine etc. were also carried out. Helping hand was always given in maintaining other electronic gadgets in station.

Improvements and Modifications

29. A new VHF antenna of greater height than the previous one was installed on Jhelum (convoy vehicle) in order to increase the VHF communication ranges.

30. A new inverted dipole aerial was fabricated for fixed freq. 4460 KHz and installed on top of Portacabin at DG.

31. During Feb' 95 to Feb' 96, this team faced many blizzards and bad weather days. The strongest blizzard recorded at Maitri Station clocked 92 kts. Every time high winds damaged some antenna or other. Like the 1 KW centre fed aerial, 4460 KHz aerial and inverted V receiver aerials or rhombic aerial. All these defects were undertaken at the earliest opportunity and system restored.

32. The main modification which was carried out after the Polar nights was on the uneven transmission line of 5KW HF transmitter. This uneven Txn line of 90 mts was causing excessive loss of power. Initially only upto 50 mts the feeder cable was available. After lot of searching around two pieces of feeder cable of same make were found in the station premises. These pieces were accurately joined together and a full length of 140 mts was made which was later installed. The balun transformer too was shifted to its new place. After the installation of new feeder cable it was seen that Delhi was receiving our Transmission QRK 2/3 with only 2.75 - 3.0 KW of power output.

Conclusion

33. This Naval Communication Team has been able to meet the diverse communication requirements of station at all times and under all circumstances. Be it bad weather, snow fall or the raging blizzards for that matter. In all total 19 to 20 convoys done by the EME Team the Navy Team took part in 07 convoys to help them out in sorting out communication problems and also to imbibe the proper use communication equipment and procedures so that the equipment could be maintained at its peak efficiency. Work continued with full dedication in best interest of the expedition and keeping in mind the best traditions of this fine service. The present communication setup at Maitri is satisfactory to meet the requirement of the expedition but there is always room for betterment and modifications in the overall interest of station and in keeping pace with modern technology. With the induction of Directional VHF/HF aerials, VHF repeaters/amplifiers the communication set up at Maitri can further be improved. It is pertinent to mention that in place like Maitri it is mandatory to keep adequate stock of equipment and spares to maintain the required efficiency throughout the year. It is easy to overcome all these deficiencies with few modifications and inductions. Maitri too can also have an excellent communication set up like any other Antarctic station, which in turn will result in better scientific output.