

**SCIENTIFIC REPORT
FOURTEENTH INDIAN EXPEDITION
TO ANTARCTICA**

TECHNICAL PUBLICATION NO. 12



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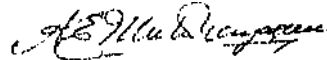
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FOREWORD

Antarctica, the last heritage of mankind and the continent of extremes has come to be known as the 'Continent of Science'. It is the nature's biggest laboratory where no outside anthropogenic interference has taken place over the ages till recent times. Being at a unique geographical location, it offers unique opportunities for a number of scientific experiments. India which joined the Antarctic bandwagon in 1981 has already made its presence felt with its uninterrupted scientific interests in the continent

This 14th Indian Scientific Antarctic Expedition (1994-96) had been successful in executing most of the tasks entrusted to them both scientific and logistic. In addition to the ongoing programmes, several new experiments on ozone measurements, daytime auroral studies, wildlife distribution pattern and long distance communication using e-mail were initiated. Planning and execution of some of the advanced scientific experiments at Antarctica speaks about the maturity level of Indian Expedition to Antarctica. This multidisciplinary and multiinstitutional task has been possible due to the deep involvement and long term commitment of various agencies in our country

The present report carries the research findings of the both summer and winter components of the 14th Indian Scientific Antarctic Expedition. Dr. S.D. Sharma, the leader of the Expedition has done a commendable job in collating the manuscripts and bringing the report in the final shape. I am sure that this report will serve to be a valuable source of data and information for the use of scientific community


(A E Muthunayagam)



DR. P.C. PANDEY
Centre Director

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P R E F A C E

It is a matter of great pleasure that the Scientific Report of XIV Indian Scientific Expedition to Antarctica is ready, which puts on record the scientific data collected and observations made during the summer and winter periods of the Expedition. The efforts put in by Dr S D Sharma, the Leader of the Expedition, deserve appreciation for collating the documents and bringing it to the final stage after getting it peer-reviewed from the experts in the field.

Ever since the inception of Indian Antarctic Expedition in 1981 and subsequently attaining the consultative party status in 1983, it has been a constant effort at Department of Ocean Development, to bring out as much science as possible through a variety of experiments run by scientists coming from different research Institutions and Universities. The wide spectrum of subjects covered by Indian scientists for the experiments at Antarctica using its unique specificity speaks volumes about the importance given to this national effort by various organisations in the country. The Antarctic programme has truly become multi-disciplinary and multi-institutional with the country's first polar research institute, Antarctic Study Centre (DOD) at Vasco-da-Gama, Goa, as the nodal agency.

In pursuance of the scientific information exchange under Antarctic Treaty Systems, this 12th Technical Publication will be a valuable source of scientific and logistic information to India's effort in Antarctica. I congratulate the Team Leader of the XIV IAE and all the team members for their fine achievements.


(P C PANDEY)

ACKNOWLEDGEMENTS

The Fourteenth Indian Scientific Antarctic Expedition with a 63 strong team was flagged off on 15th December, 1994 by Sh. Eduardo Faleiro, the Minister of Chemicals and Fertiliser . The blessings for the success of the expedition were also received from Sh. J.V.R. Prasada Rao, Joint Secretary (DOD) and Dr. E. Desa, Director NIO .The leaders of the previous expeditions Sh. Rasik Ravindra (IX) and Sh. Mukerji (XI) were also present for advice and encouragement. The heads of various Institutions were also present to bless the participants. The ship sailed off on 17th Dec., 1994 at 2100 Hrs.

The team comprised of a scientific component, Army and Navy components. A medical officer from IAF was also a member of the winter team. As is customary, the next day, the team was assembled and different sub-committees were formed to take care of various aspects of life onboard the ship which included a mess committee, entertainment committee, seminar committee etc. I wish to acknowledge the good work done by these committees during the cruise of the ship.

Equator crossing ceremony (21st December) was organised by the naval component under the command of Lt Cdr Sekhon and provided a little fun on board. By now, for many of the members the rolling and pitching proved tough and were down with sea sickness. There was a sigh of relief when the ship touched Port Louise for repair and cargo. The expedition was well received by the staff of Indian High Commission in Mauritius. The co-operation extended by the High Commission of India in Mauritius is thankfully acknowledged.

After crossing 40°S on second January, the ship entered Antarctic Polynya on 10th of January 1995. I thank the leader of XIII IAE Sh. Sudhakar Rao and his team members for a hearty welcome on our arrival at Maitri as our first visit on 13th January. Subsequently, the co-operation extended by the XIII IAE during charge handing-taking and the overlap period is thankfully acknowledged. The summer period was highly disturbed by frequent periods of bad weather and finally the ship left Antarctica on 6th March leaving twenty five members behind.

The presence of Dr.A.Mitra as DOD observer was a boon .It helped in day-today planning, liaison with DOD and convey the ground difficulties for future improvements.

I acknowledge with thanks, the excellent co-operation and understanding shown by the Ship's (MV Polar Bird) Captain L.M.Gaasoe and his crew during the expedition.

Thanks are due to the Russian Leaders of Novolazarevskaya Dmitriev Nikolay Kusmitsh (39th RAE) and Victor Vederovich (40th RAE) and their team mates for a very cordial relationship and the help extended from time to time. The Indian and Russian Stations in close proximity added with tradition of mutual co-operation and understanding makes the life much more enjoyable and secured.

Midwinter day (21st June) has become a common festival for all Antarcticans irrespective of the nationality. It is the time when half of the polar night is already over. A large number of greetings from National and International Leaders were received which besides boosting the morale of the expeditioners, enhances international brotherhood in Antarctica. The prominent among them were :

Sh.P. V. Narasimha Rao (PM); Dr. A.E. Muthunayagam (Secretary, DOD); Jacques Chirac, President of France; Sh. Eduardo Faleiro (Min. of State for Chemicals and Fertilizers); Chilean and Brazilian Antarctic Institutes, Vostok, Mirny, Syowa Antarctic Stations. Greetings were received from the officers and staff of DOD; Sh.S.Mukerji and Institutions like IIG (Mumbai), R&DE (engrs) Pune and GSI, Faridabad. Our German friends, later the members of Geomaud Expedition also sent the greetings. Our special thanks to R & DE (engrs) Pune for greetings on practically all National or festival days.

I feel that the success of the expedition can be achieved only through team work and it depends on the contribution from one and all. All my team members deserve a word of appreciation for excellent discipline and brotherhood during the course of long isolation and stress. The names of Sqn Ldr S.Anant, Maj. M.V. Kumar, Sh.S.A Kane and Sh. N.Deshmukh deserve a special mention.

I sincerely thank Sh. Arun Chaturvedi, the Leader of the 15th IAE and his team members for co-operation and understanding during the overlap period.

At this point one can't forget the contribution of the family members towards the success of the expedition in way of maintaining a good atmosphere back home and constant morale boosting through their communications. I shall thank Mrs Usha Sharma, Vishal Sharma and Vikas Sharma for their whole hearted support during the expedition.

This report contains scientific contributions from different participants of the expedition. The papers have been scrutinised by the experts before publication for which they deserve special thanks.

Last, but not the least, I acknowledge with indebtedness the confidence reposed in me and the co-operation extended to me by the Heads of the Department at NPL, Dr. B. M. Reddy and Dr. K.K.Mahajan. The confidence and co-operation shown by the staff and officers at DOD and their moral support has gone a long way in the success of the expedition. My special thanks to Dr. A.E.Muthunayagam, Secretary DOD and Dr. P.C. Pandey, centre director for their guidance and advise. The support and co-operation extended by Dr. T.V.P Bhaskara Rao, D. A. Mitra and Sh. P.S. Singh during the expedition and after has gone a long way in making the expedition a success which returned safe and sound on 20th March 1996.

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DR. S.D.SHARMA

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T H E T E A M

SI No	Name	Organisation
Winter Component		
1	Dr S D Sharma Leadei & Station Commander	National Physical Laboratory
2	Dr V C Nagar	National Physical Laboratory
3	Sh KS Hosalikar	Indian Meteorological Dept
4	Sh P N Machnurkar	Indian Meteorological Dept
5	Sh S A Kane	R&DE
6	Sh N P Deshmukh	R&DE
7	Lt Vikas Dhasmana	Indian Navy
8	Sh HS Chauhan, PO (Tel)	Indian Navy
9	Sh HS Yadav.CHEL R	Indian Navy
10	Sh K S Raj, PICK (O)	Indian Navy
11	Major P M Meena	Indian Army
12	Major M V Kumar	Indian Army
13	Nb Sub 'A' Veh Jawahar Jha	Indian Army
14	Sub 'B' Veh K J Paul	Indian Army
15	Sub 'B' Veh S A Gaffar	Indian Army
16	Sub O P Verma	Indian Army
17	Sub Elect B L Shah	Indian Army
18	Sub Elect Prabhu Dayal	Indian Army
19	Nb Sub 'C' Veh P S Jamwal	Indian Army
20	Sub/AEM Munshi Ram	Indian Army
21	Hav Eng Fti Raju Mohan	Indian Army
22	Hav Elect K K Suresh	Indian Army
23	Sub/Caj Santokh Singh	Indian Army
24	Sqn Ldr S Anant	D G A F M S
25	Major Alok Sharma	D G A F M S
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26	Sh B R Bejarniya	Geological Survey of India
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28	Sh V Ravikant	Geological Survey of India
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30	Dr N Sundararajan	Osmania University
31	Sh Bachi Ram	Survey of India
32	Sh N Mohandas	Survey of India

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35	Dr R Sndharan	Physical Research Laboratory
36	Sh NK Modi	Physical Research Laboratory
37	Sh B C Arya	National Physical Laboratory
38	Ms Jaya Narthani	National Physical Laboratory
39	Sh Rajesh Kalra	Indian Institute ol Geomagnetism
40	Dr K Venkataraman	Zoological Survey of India
41	Sh TS Bhatt	R&DE
42	Sh S V Gowd	R&DE
43	Dr L Singh	DRDE, Gwahor
44	Dr A Mitra	D O D Observer
45	Ms S R Nair	NEERI
46	Sh G Sunderesan	AI IMS
47	Dr L A Kami	AI IMS
48	Lt Cdr G S Sekhon	Indian Navy
49	LtAK Kinoo	Indian Navy
50	Lt D Yadav	Indian Navy
51	Lt S Snvatsa	Indian Navy
52	Lt Cdr H N Satish	Indian Navy
53	Lt K V Manoj	Indian Navy
54	Sh M M Thomson, CHAA	Indian Navy
55	Sh Prandare, AM3	Indian Navy
56	Sh S R Yadav, POELAR	Indian Navy
57	Sh A K Suman, EAA3	Indian Navy
58	Sh K Jayakumar, LCK(O)	Indian Navy
59	Sh M Singh, LCK(O)	Indian Navy
60	Lt Cdr R Singh	Naval Hydrography
61	Sh S Kumar	Naval Hydrography
62	Sh N Ravindran	Naval Hydrography
63	Sh B T Joseph	Naval Hydrography