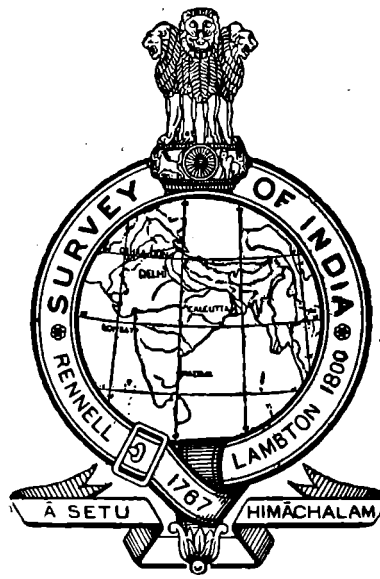
SURVEY OF INDIA

GENERAL REPORT

1963



From 1st April 1962

To 31st March 1963

PUBLISHED BY ORDER OF
BRIGADIER J. S. PAINTAL, M.I.S., M.I.E.
SURVEYOR GENERAL OF INDIA

PRINTED AT THE SURVEY OF INDIA OFFICES, 103 (P.Z.O.) PRINTING GROUP,
DEHRA DŪN 1968.

Price Rupees Sixtyseven and Ninetyfive paise

HOW TO OBTAIN ASSISTANCE FROM THE SURVEY OF INDIA

1. Applications for surveys of any kind or aerial photography whether for private or government purposes should be made to one of the following officers :—

(*a*) The Surveyor General of India, Dehra Dūn (*Telegrams "SURVEYS"*).

(*b*) The Director, Northern Directorate, Survey of India, Dehra Dūn (*Telegrams "SURNORTH"*).

(*c*) The Director, Eastern Circle, Survey of India, Calcutta (*Telegrams "SUREAST"*).

(*d*) The Director, Southern Circle, Survey of India, Bangalore (*Telegrams "SURSOUTH"*).

(*e*) The Director, Western Circle, Survey of India, Abu (*Telegrams "SURWEST"*).

States/Union Territories contained in each Survey Circle/ Directorate according to the political set up as on 31st March 1963 are as below :—

1. ***Northern Directorate***

Delhi
Himāchal Pradesh
Jammu & Kashmīr
Punjab
Uttar Pradesh
Greater part of Manipur, Parts of Assam, Bihār, Madhya Pradesh and West Bengal.

2. ***Eastern Circle***

Andaman & Nicobar Islands
Orissa
Tripura
West Bengal
Parts of Assam, Bihār and Manipur.

3. ***Southern Circle***

Andhra Pradesh
Goa (of Goa, Damān and Diu)
Kerala
Laccadive, Minicoy & Amindivi Islands
Madras
Mysore
Pondicherry
Part of Madhya Pradesh.

4. ***Western Circle***

Dādra and Nagar Haveli
Damān and Diu (of Goa, Damān and Diu)
Gujarāt
Mahārāshtra
Rājasthān.

In general, enquiries should be made from the Director in whose Circle/Directorate the area to be surveyed or photographed falls.

2. Applications for maps may be made to the Director, Map Publications, Survey of India, Hāthībarkala, Dehra Dūn (*Telegrams "SURPUB"*) or to the either of the officers mentioned at (*c*) and (*d*) above, or to recognized map sales agents, a list of whom is given in the Survey of India Map Catalogue. There is also a departmental Map Sales Section at Janpath Barracks 'A' (near Cottage Industries Emporium), First Floor, New Delhi-1.

3. Applications for tide tables, survey data pamphlets or other departmental publications and enquiries on geodetic and geophysical subjects are to be addressed to the Director, Geodetic and Research Branch (previously Deputy Director, Geodetic and Research Branch), Survey of India, Dehra Dūn (*Telegrams "SURSEARCH"*).

4. Applications for any kind of lithographic printing should be made to the following officers, as convenient :—

(*a*) The Director, Map Publication, Hāthībarkala, Dehra Dūn.

(*b*) The Director, Eastern Circle, Calcutta.

Letterpress printing and block making and engraving work are also undertaken by the officers mentioned at (*a*) and (*b*) above, respectively.

Printing demands from Central Government agencies should be routed through the Chief Controller of Printing and Stationery, New Delhi.

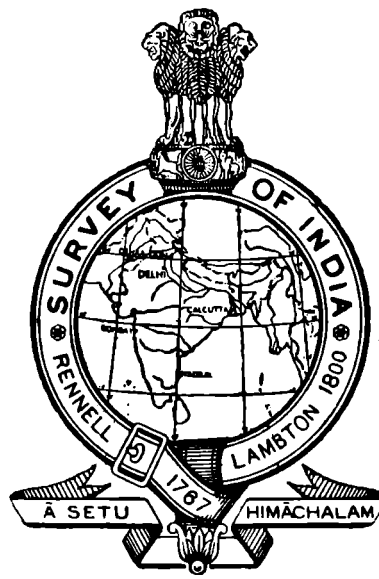
5. Checking and correction of the external boundary of India on maps of India produced by the other government departments or by the private firms are also done by the Director, Map Publication.

6. Correct names and spellings (in Roman or Devanāgri script) for villages, towns, etc., in India can be ascertained from the regional Directors mentioned in para 1 above or from the Director, Map Publication.

7. All enquiries regarding photogrammetry and training of government officers in survey methods should, in the first instance, be addressed to the Director, Northern Directorate, Survey of India, Dehra Dūn and the Senior Director, Pilot Production and Training Centre (previously Director, Training Directorate), Survey of India, Hyderābād (*Telegrams "SURPROTRAIN"*) respectively.

SURVEY OF INDIA

GENERAL REPORT
1963



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GLOSSARY

Scales are referred to as follows :—

(*a*) *for scales which are multiples of 1 : 1,000,000*—"1 : M scale", "1 : 6 M scale", &c., which mean "1 : 1,000,000 scale", "1 : 6,000,000 scale", &c.

(*b*) *for scales smaller than 4 miles to one inch*—"50-mile scale", "8-mile scale", &c., which mean "scale of 50 miles to one inch", "scale of 8 miles to one inch", &c.

(*c*) *for scales of and larger than 4 miles to one inch*—"¼-inch scale", "½-inch scale", "4-inch scale", "16-inch scale", &c., which mean "scale of ¼-inch to one mile", &c.

(*d*) *for other scales*, by their representative fraction, *e.g.*, "1 : 10,000", "1 : 25,000", "1 : 50,000", "1 : 250,000", &c.

Serial Numbering of Survey of India Maps—

Sheets NE-43, NF-44, &c., are sheets on 1 : M scale (International Numbering).

Sheets 65, 78, &c., are sheets on 1 : M scale (on India and Adjacent Countries Series—now superseded by above).

Sheets 65 K, 78 F, &c., are ¼-inch sheets or sheets on the corresponding metric scale of 1 : 250,000.

Sheets 65 K/N.W., 78 F/S.E., &c., are ½-inch sheets.

Sheets 65 K/1, 78 F/16, &c., are 1-inch sheets or sheets on the corresponding metric scale of 1 : 50,000.

*Sheets 65 K/1/1, 78 F/16/2, &c., are 1 : 25,000 sheets.

The system of numbering is fully explained in the indexes at the end of this report.

Explanation of Abbreviations—

G.C.S.	.. General Central Service.
H.L.O.	.. Hāthībarkala Litho Office (Dehra Dūn).
P.L.O.	.. Photo-Litho Office (Calcutta).
P.Z.O.	.. Photo-Zinco Office (Dehra Dūn).
D.O.	.. Drawing Office.
M.R.I.O.	.. Map Record and Issue Office.
I.C.A.O.	.. International Civil Aviation Organization.
G.T.	.. Great Trigonometrical.
C.W. & P.C.	.. Central Water and Power Commission.
G.S.G.S.	.. Geographical Section, General Staff.
C.I.M.	.. Carte Internationale du Monde.
V.I.	.. Vertical Interval.
C.P.W.D.	.. Central Public Works Department.
D.G.S. & D.	.. Director General of Supplies & Disposals.
I.S.I.	.. Indian Standards Institution.
I.N.C.O.R.	.. Indian National Committee on Oceanographic Research.

Definitions of Surveys—

Old Surveys are those carried out prior to 1905.

Modern Surveys are those carried out since 1905.

Original Surveys are Modern Surveys carried out for the first time on a specified scale.

Revision Surveys are those carried out in areas where the existing Original Survey is on the same or larger scale.

Verification Surveys are Revision Surveys directed towards the checking of specified items of detail reported to have undergone changes.

Blue-print Survey is one carried out on light blue-prints of the existing survey, old or modern.

Colour-print Survey is one carried out on coloured prints (usually dark grey outline and brown contours) of an area covered by Modern Survey.

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* 1 : 25,000 SHEETS :—Each 1-inch sheet is divided into six 1 : 25,000 sheets, numbered from 1 to 6 as shown in the diagram alongside. The number of a 1 : 25,000 sheet thus takes the form 65 K/1/1.

65 K/1

1	4
2	5
3	6

CONTENTS

INDEX MAPS

(appended at the end)

A. Modern Topographical Surveys and Compilation on metric as well as F.P.S. systems.

B. Modern Topographical Surveys and Revision (1-inch, $\frac{1}{2}$-inch and 1 : 50,000 scales) by 10-year periods from 1905.

C. Project Surveys in hand.

D. Maps published on 1-inch and $\frac{1}{2}$-inch scales.

E. Maps published on $\frac{1}{4}$-inch scale.

F. Carte Internationale du Monde Series, 1 : M scale.

G. Southern Asia Series, 1 : 2 M scale.

PREFACE

The history and work of the Survey of India Department have been fully described in the *Prefaces* to the General Reports up to and for the year 1953 and are not, therefore, repeated here.

The current report has been arranged in almost the same sequence as the General Report for the preceding year 1962, *viz.*, reports of the Topographical Circles/Directorates together with Tables A, B and C in *Part I* ; Map Publication and Office Work in *Part II* ; Geodetic Work together with Table C in *Part III* ; and Index Maps at the end.

Sections I and *II* of the report are compiled in the office of the Surveyor General of India, with the help of the data received from various Circles/Directorates, whereas *Sections III to VII* are compiled by the regional Directors concerned and *Section VIII* by the Directors, Training Directorate. *Part II* is compiled by the Director, Map Publication and *Part III* by the Deputy Director, Geodetic and Research Branch. The report as a whole is edited in the Surveyor General's Office. If any further information, clarification or amplification regarding the work described in the various sections of this report is required by the readers, it will save time if they make a direct reference to the Director responsible for compiling the particular Section.

The field survey work carried out during the year under report was in accordance with the programme assigned to the Department for the Third Five-Year Plan period by the Survey Priorities Committee (See Appendix B to the General Report 1962).

SURVEY OF INDIA

GENERAL REPORT 1963

From 1st April 1962
To 31st March 1963

1. INTRODUCTION AND SUMMARY

1. **General.**—The annual General Reports of Survey of India covers the period of the financial year viz., from 1st April to 31st March and includes an abstract as well as details of topographical and other surveys together with their areas, out-turns and cost rates (in *Part I*); of fair drawing, printing, publications and map issues, both departmental and extra-departmental (in *Part II*); and a brief narrative of geodetic work together with their areas, out-turns and cost rates (in *Part III*). The purpose of this report is to acquaint the various departments of the Central and State Governments of India, and others, interested with the activities of Survey of India.

A *Technical Supplement to General Report* containing the record of the out-turns of individual field workers is also compiled but is aot printed.

The progress of modern (i.e., post-1905) topographical survey and compilation carried out by the department is illustrated in metric as well as F.P.S. system, in *Index A* at the end of this report while *Index B* indicates the relative modernity of modern surveys on 1-inch or 1 : 50,000 and $\frac{1}{2}$-inch scales. *Index C* shows project surveys in hand and the remaining *Indexes D, E, F* and *G* show all the standard maps which have been published up to date on various scales. It will be seen from *Index D* that the areas within India which are blank on *Index A* are almost entirely covered by topographical maps. These maps are mostly uncontoured, drawn in the old style and many years out of date. They have hence been excluded from *Index A*.

It may be mentioned here that besides the standard maps shown in *Indexes D, E, F* and *G*, this department also publishes Aeronautical Charts on the 1 : M scale, Landing and Approach Charts on scales of 1 : 30, 000/1 : 50,000 and 1 : 250,000 respectively for all civil aerodromes in India, State Maps on the 1 : M scale, Town Guide Maps on scales varying from 3 inches to 16 inches to one mile (scales in metric system at present being 1 : 20,000 in

plains and 1 : 10,000 in hills), general maps of India on scales of 40, 70, 128 and 192 miles to an inch (scales in metric system being 1 : 2,500,000, 1 : 4,000,000 or 1 : 4,500,000, 1 : 8,000,000, 1 : 12,000,000 and 1 : 16,000,000, and special maps such as the Railway Map of India and the Road Map of India.

2. Surveyor General's Office.—The post of the Surveyor General of India was held by the officers as shown below :—

SURVEYOR GENERAL OF INDIA	SHRI E. R. WILSON, B.A., M.I.S., to 30-4-62.
	BRIGADIER GAMBHIR SINGH, M.I.S., from 1-5-62.

The posts of the Deputy Surveyor General and Assistant Surveyor General were held by the officers as shown below :—

DEPUTY SURVEYOR GENERAL	COLONEL J. N. SINHA, B.Sc. (Hons.), M.Sc., M.I.S., M.I.E.
ASSISTANT SURVEYOR GENERAL	MAJOR J. P. G. KING, B.Sc., B.T., Engineers, to 19-8-62.
	SHRI D. BISWAS, B.A. (Hons.), from 20-8-62.

3. Cost of the Department.—The total cost of the department for the year ending 31st March 1963 as compared with those for the previous two years was as follows :—

	1960-61	1961-62	**1962-63**	REMARKS
	Rs.	*Rs.*	*Rs.*	
Gross actual cost ..	1,80,42,345	1,97,02,340	**3,21,57,753**	
Deduct–recoveries ..	55,65,004	43,17,638	**55,84,244**	
Net actual charges ..	1,24,77,341	1,53,84,702	**2,65,73,509**	

4. Sanctioned strength of the Department.—A statement showing the total number of sanctioned posts in the Survey of India as on 31st March 1963 is given below :—

Designation of posts	Number	
	Permanent	Temporary
1. FIXED ESTABLISHMENT:		
(a) Class I Service.—		
Surveyor General	1	..
Directors	8	..
Deputy Directors	6	5
Superintending Surveyors	34	14
Deputy Superintending Surveyors ..	22	7
Officer-in-Charge, Map Record & Issue Office	1	..

Designation of posts	Number Permanent	Number Temporary
b) General Central Service Class I.—		
President, G. & R.B.	1	..
Superintendent, Instrument Repair Shop..	1	..
Managers, Reproduction Offices ..	4	..
Mathematical Adviser	1	..
Deputy Stores Officer	1	..
Senior Scientific Officer	1	..
(c) Class II Service.—		
Officer Surveyors	105	18
(d) General Central Service Class II.—		
Head Engraver	1	..
Registrars	2	1
Assistant Managers, Reproduction Offices	8	*
Electrical Engineer	1	..
Map Curator	1	..
Assistant Stores Officers	2	1
Medical Officers	3	..
Labour Welfare Officer	1	..
Assistant Head Engraver (Non-Gazetted)	1	..
(e) Class III Service.—		
(i) Technical.—		
Surveyors	85	48
Survey Assistants	43	25
Draftsmen	26	20
Engravers	7	..
Assistant Supervisor, Printing Office	1	..
Technical Assistants	41	..
Stores Assistants	8	2
Recordkeepers	1	1
Junior Technical Assistants ..	..	3
(ii) Ministerial.—		
Superintendents	1	3
Assistants	6	8
Stenographers	2	1
Clerks, Upper Division ..	13	9
Clerks, Lower Division ..	10	18
(iii) Miscellaneous.—		
Security Supervisors	1	1
Superintendents, Vehicles ..	..	3
Fire Officer	..	1
(f) Class IV Service.—		
Class IV personnel	22	7
II. UNFIXED ESTABLISHMENT.—		
Class III Service.—		
(i) Technical.—		
Surveyors, Grade II		45
Topo Trainees Type 'A'		111
Scientific Assistants	7	1
Geodetic Computers	11	4
Plane-tablers	216	84
Air Survey Draftsmen	77	25
Draftsmen	327	186

Designation of posts	Number Permanent	Temporary
Computers	46	89
Traversers	2	..
Levellers	1	1
Recordkeepers	49	19
Reproduction Personnel	318	56
Engravers	13	..
Topo Trainees Type 'B'	..	585
Topo Auxiliaries	36	20
Storekeepers (Topo.)	30	13
(*ii*) *Ministerial.*—		
Office Superintendents	9	1
Head Clerks and Head Accountants ..	13	1
Stenographers	2	9
Clerks, Upper Division	142	13
Clerks, Lower Division	81	278
(*iii*) *Miscellaneous.*—		
Motor Mechanics	13	5
Motor Drivers	16	99
Compounders	3	1
Telephone Operators	2	2
Electrician	2	1
Fitter Mechanic	1	..
Librarian	1	..
Head Artificer, Assistant Head Artificer, Other Artificers, etc.	31	13
Head Packer	1	..
Assistant Security Supervisors ..	..	3
Hindi Teacher	..	1
Midwife	..	1
Class IV Service.—		
Regular Establishment	1106	1144
Contingent	..	3471

5. Raising, Transfer and Disbandment of Units.—*New units.*—The following new units were raised during the year under report :—

(*a*) No. 6 Drawing Office was raised in Northern Directorate with headquarters at Dehra Dūn (U.P.) with effect from 2nd April 1962.

(*b*) No. 34 Party was raised in Southern Circle with headquarters at Bangalore (Mysore) with effect from 16th August 1962.

(*c*) No. 35 Party was raised in Northern Directorate with headquarters at Agartala (Tripura) with effect from 1st December 1962.

(*d*) No. 36 Party was raised in Training Directorate with headquarters at Dehra Dūn (U.P.) with effect from 7th January 1963.

The following units were transferred :—

(*a*) No. 27 Party was transferred from the administrative control of the Deputy Director, Geodetic and Research Branch to that of the Director, Northern Directorate with effect from 1st April 1962.

(*b*) Nos. 12 and 29 Parties were transferred from the administrative control of the Director, Eastern Circle to that of the Director, Northern Directorate with effect from 11th April 1962.

(*c*) No. 11 Party was transferred from the administrative control of the Director, Training Directorate to that of the Director, Eastern Circle with effect from 1st June 1962.

(*d*) No. 2 Party was transferred from the administrative control of the Director, Northern Directorate to that of the Director, Western Circle with effect from 1st August 1962.

(*e*) No. 7 Party was trasferred from the administrative control of the Director, Western Circle to that of the Director, Eastern Circle with effect from 16th October 1962.

(*f*) No. 13 Party was transferred from the administrative control of the Director, Training Directorate to that of the Director, Western Circle with effect from 16th October 1962.

(*g*) Nos. 10 and 34 Parties were transferred from the administrative control of the Director, Southern Circle to that of the Director, Training Directorate with effect from 15th November 1962.

6. Shift of Headquarters.—(*a*) The headquarters of the Training Directorate were transferred from Dehra Dūn (U.P.) to Hyderābād (A.P.) with effect from 15th November 1962.

(*b*) The headquarters of Nos. 1 and 28 parties were transferred from Mussoorie (U.P.) to Dehra Dūn (U.P.) with effect from 15th October 1962.

(*c*) The headquarters of No. 3 Party was transferred from Abu (Rājasthān) to Mussoorie (U.P.) with effect from 1st April 1962 and subsequently from Mussoorie (U.P.) to Dehra Dūn (U.P.) with effect from 15th October 1962.

7. Deputations.—LT.-COLONEL K. L. KHOSLA, Deputy Director, Geodetic and Research Branch went on deputation to Paris (France) to attend a meeting of the International Gravity Commission between the 10th and 15th September 1962.

MAJOR N. B. NAYAR, Superintending Surveyor proceeded for advanced training in photogrammetry at the International Training Centre for Aerial Surveys, Delft (the Netherlands) under the NEBUTA Fellowship.

SHRI V. RANGAN, Superintending Surveyor proceeded on deputation to U.K. for training in Electronic Computers and Tidal Work under the Colombo Plan.

8. Distinguished Visitors.—SHRI M. G. RAJA RAM, I.A.S., Joint Secretary, Ministry of Scientific Research and Cultural Affairs visited the Map Publication Offices at Dehra Dūn on the 13th June 1962 for discussions with the Director, Map Publication.

Earlier, SHRI RAJA RAM inspected the office of No. 25 Party at Mussoorie on the 11th June 1962.

MR. A. L. F. de SPINDLER, Manager of the Karnali Project, Government of Nepāl visited the Survey of India Offices at Dehra Dūn on the 19th June 1962.

SHRI S. F. LAKHANI, Fire Adviser to the Government of India Ministry of Defence visited the Southern Circle Offices at Bangalore between the 18th–20th June 1962 for discussion with the Director, Southern Circle regarding fire-fighting measures. He also visited the Map Publication and the Northern Directorate Offices at Dehra Dūn on the 7th July 1962 for discussions regarding the fire-fighting measures.

DR. MONO MOHON DAS, Deputy Minister, Scientific Research and Cultural Affairs, Government of India, accompained by SHRI M. G. RAJA RAM, Joint Secretary and SHRI M. M. KUSARI, Deputy Secretary of the Ministry visited the Map Publication Offices at Dehra Dūn on the 3rd July 1962. Later, the Deputy Minister visited the Eastern Circle Offices at Calcutta on the 13th July 1962.

SHRI M. G. RAJA RAM, I.A.S., Joint Secretary inspected Camp No. III of No. 3 Party of the Northern Directorate at Srīnagar on the 18th July 1962.

DR. (MRS.) T. S. SOUNDARAM RAMACHANDRAN, Deputy Minister for Education, Government of India visited the Survey of India Offices at Dehra Dūn on the 17th August 1962.

SARVA SHRI N. MUTHUKUMARASWAMY, Superintending Engineer, Investigations, Madras Electricity Board and K. S. SHAMANNA, Executive Engineer, Hydro-electrical Construction Project Department held discussions with SHRI L. J. BAGNALL, Director, Southern Circle on the 21st August 1962 in connection with survey for Hogenakal Project and Bedti Reservoir in Mysore State.

SHRI U. PARIKH, Minister for Agriculture and Forests, Gujarāt State visited the Map Publication Offices at Dehra Dūn on the 3rd October 1962.

SHRI M. M. KUSARI, I.A.S., Deputy Secretary, Ministry of Scientific Research and Cultural Affairs participated in the meeting of the Southern Circle Departmental Promotion Committee held at Bangalore on the 10th October 1962. Accompanied by SHRI L. J. BAGNALL, Director, Southern Circle he held discussions with the Revenue Secretary, Government of Mysore on the same day, in connection with the acquisition of land for construction of Survey of India Offices.

SHRI M. M. JAIN, Under Secretary, Ministry of Scientific Research and Cultural Affairs, visited Dehra Dūn on the 19th and 20th October 1962 for participation in the local Departmental Promotion Committee meetings of Map Publication Office and Surveyor General's Office. He also visited the Geodetic and Research Branch Museum.

SHRI M. M. KUSARI, Deputy Secretary, Ministry of Scientific Research and Cultural Affairs visited Western Circle Office at Abu on the afternoon of 2nd November 1962.

The Honourable Minister for Scientific Research and Cultural Affairs, PROFESSOR HUMAYUN KABIR paid a visit to the office of the Director, Training Directorate at Hyderābād on the 26th December 1962. Later on, COLONEL J. A. F. DALAL, Director, Training Directorate accompanied the Honourable Minister on his tour to Warangal and Rānāppa Lake on the 27th December 1962.

PROF. V. A. MAGNITSKY, Head of the Physics of Earth Crust of the Physical Faculty of the Moscow State University visited the Survey of India Offices at Dehra Dūn between 22nd and 24th December 1962 and delivered two lectures on modern vertical movements of the earth's crust and their motives and origin of continents and oceans in the light of the latest geophysical data.

SHRI M. M. KUSARI, Deputy Secretary, Ministry of Scientific Research and Cultural Affairs visited the office of the Director, Eastern Circle on the 15th December 1962 in connection with a local Departmental Promotion Committee.

DR. K. P. BASU, O.S.D., Planning Commission visited the Surveyor General's Office between the 18th and 20th February 1963 for discussions with the Surveyor General of India.

SHRI A. K. GHOSH, I.C.S., Secretary to the Government of India, Ministry of Scientific Research and Cultural Affairs visited the office of the Director, Training Directorate at Hyderābād on the 8th March 1963.

VICE-ADMIRAL B. S. SOMAN, Chief of the Naval Staff visited the Survey of India Offices at Dehra Dūn on the 6th March 1963.

REAR-ADMIRAL E. G. IRVING, C.B., O.B.E., Hydrographer of the Royal Navy, U.K., accompanied by his Chief Civil Hydrographic Officer MR. L. N. PASCO visited the Survey of India Offices at Dehra Dūn on the 21st March 1963.

MADAME N. V. MEDNIKOVA, Chief of the Laboratory on Ionospheric Research in the Izmiran (U.S.S.R.) and PROFESSOR V. I. POCHTAREV, Director of the Leningrad Branch of the Institute of Terrestrial Magnetism of Izmiran accompanied by SHRI C. SUBRAMANAYAM from the National Physical Laboratory, New Delhi visited the Geodetic and Research Branch on the 29th and 30th March 1963.

9. **Conferences and Meetings.**—*Planning Commission.*—A meeting of the Working Group on Co-ordinated Studies of Surveys of the Technical Committee on Land of the Committee on Natural Resources of the Planning Commission was held in the Survey of India Offices at Dehra Dūn on the 3rd and 4th April 1962 under the Chairmanship of DR. M. S. RANDHAWA, Adviser (Resources) of the Planning Commission. The Survey of India was represented by the undermentioned officers :—

(*i*) SHRI E. R. WILSON, Surveyor General of India.

(*ii*) COLONEL J. N. SINHA, Deputy Surveyor General.

(*iii*) LT.-COLONEL M. M. DATTA, Deputy Director, Photogrammetry.

(*iv*) MAJOR Y. RAMACHANDRAN, Assistant Surveyor General.

A meeting of the Working Group of the Standing Committee on Natural Resources (Planning Commission) was held in the Survey of India Offices at Dehra Dūn on the 11th, 12th and 13th June 1962. DR. M. S. RANDHAWA, Adviser (Resources), Planning Commission presided.

BRIGADIER GAMBHIR SINGH, Surveyor General of India visited Delhi on the 14th December 1962 for discussions with the Planning Commission. He again visited Delhi between the 30th January and 1st February 1963 for discussions with the Planning Commission.

COLONEL J. N. SINHA, Deputy Surveyor General visited Delhi on the 12th–14th, 18th, 21st and 24th December 1962 for discussions with the various Ministries of the Government of India and the Planning Commission. He again visited Delhi on the 4th and 5th and between the 28th January and 1st February 1963 for discussions with various Ministries of the Government of India and the Planning Commission.

LT.-COLONEL M. M. DATTA, Deputy Director (Photogrammetry), Northern Directorate, attended the 7th Indian Standard Convention at Calcutta, from 28th January 1963 to 2nd February 1963 as an official delegate from the Survey of India.

Union Public Service Commission.—BRIGADIER GAMBHIR SINGH, Surveyor General of India visited Delhi on the 16th and again on the 21st and 22nd August 1962 for discussions with the Ministry of Scientific Research and Cultural Affairs and to attend a meeting at the Union Public Service Commission.

SHRI J. C. ROSS, Director, Map Publication visited Delhi on the 2nd August 1962 to attend a meeting at the Union Public Service Commission.

BRIGADIER GAMBHIR SINGH, Surveyor General of India visited Delhi between the 10th and 12th and again on the 18th September 1962 for discussions with the Ministries of the Government of India. He also attended a meeting with the Surveyor General of Pākistān at Delhi and participated in a Union Public Service Commission Interview Board meeting. He again visited Delhi on the 19th January 1963 to attend a meeting with the Union Public Service Commission.

Reviewing Committee.—SHRI E. R. WILSON, Surveyor General of India visited Roorkee on the 6th April 1962 for discussions with LT.-GENERAL H. WILLIAMS, Member, Reviewing Committee. He also visited Delhi from 9th to 12th April 1962 for discussions with the Reviewing Committee and attended meetings of the Central Water and Power Commission and the Planning Commission.

LT.-COLONEL K. L. KHOSLA, Deputy Director, Geodetic and Research Branch visited Delhi from 1st to 9th April 1962 for discussions with the Reviewing Committee, the Indian Standards Institution, Standing Metric Committee and the Indian National Committee on Oceanic Research.

The special Committee appointed by the Government of India, with the Surveyor General of India as the President and the Deputy Surveyor General and the Directors as Members, to examine the Report of the Reviewing Committee for the Survey of India and the National Atlas Organization, assembled in the Surveyor General's Office, Dehra Dūn on the 7th and 8th July 1962. COLONEL O. P. ANAND, Deputy Director, Military Survey and LT.-COLONEL K. L. KHOSLA, Deputy Director, Geodetic and Research Branch attended by special invitation.

Standing Committee—Northern Directorate.—A meeting of the Standing Committee of the Northern Directorate of the Survey of India was held in the Surveyor General's Office at Dehra Dūn on the 14th June 1962. SHRI M. G. RAJA RAM, Joint Secretary, Ministry of Scientific Research and Cultural Affairs, presided.

The 4th meeting of the Standing Committee of the Northern Directorate was held at Srīnagar on the 19th July 1962 under the Chairmanship of SHRI M. G. RAJA RAM, Joint Secretary. BRIGADIER GAMBHIR SINGH, Surveyor General of India and COLONEL J. N. SINHA, Deputy Surveyor General attended the meeting.

BRIGADIER GAMBHIR SINGH, Surveyor General of India visited Delhi on the 6th, 20th and 21st and again between the 26th and 28th November 1962 for discussions with the various Ministries of the Government of India and to attend a meeting of the Standing Committee of the Northern Directorate.

Departmental Promotion Committee.—A meeting of the Departmental Promotion Committee was held in the Surveyor General's Office from the afternoon of 3rd to 5th July 1962 under the Chairmanship of BRIGADIER GAMBHIR SINGH, Surveyor General of India, to consider the selection of personnel for promotion to the next higher grade in Class III, Divisions I and II and Ministerial Establishments of the Department. All the Directors, Deputy Surveyor General and the Deputy Director, Geodetic and Research Branch attended.

SHRI N. K. SREENIVASAN, Under Secretary, Ministry of Scientific Research and Cultural Affairs, participated in the deliberations of the meeting as the representative of the Ministry.

MAJOR J. P. G. KING, Assistant Surveyor General acted as the Secretary of the committee.

Another meeting of the Departmental Promotion Committee was held in the Surveyor General's Office on the 13th February 1963 under the Chairmanship of BRIGADIER GAMBHIR SINGH, Surveyor General of India. The following Officers attended the meeting :—

(*i*) COLONEL R. S. KALHA, Director, Map Publication.

(*ii*) COLONEL J. N. SINHA, Deputy Surveyor General.

(*iii*) SHRI M. M. JAIN, Under Secretary, Ministry of Scientific Research and Cultural Affairs.

(*iv*) LT.-COLONEL M. L. CHOPRA, Deputy Director, Northern Directorate (representing Director, Northern Directorate).

(*v*) LT.-COLONEL K. L. KHOSLA, Deputy Director, Geodetic and Research Branch.

SHRI D. BISWAS, Assistant Surveyor General acted as Secretary.

Directors' Conference.—The Annual Directors' Conference was held in the Surveyor General's Office at Dehra Dūn on the 6th and 7th July 1962. All the Directors, Deputy Surveyor General and the Deputy Director, Geodetic and Research Branch were present. COLONEL O. P. ANAND, Deputy Director, Military Survey also attended the conference. The conference was presided over by BRIGADIER GAMBHIR SINGH, Surveyor General of India.

Development Projects.—A conference of the Chief Engineers from West Bengal, Assam, Bihār, Orissa and Manipur with the representatives of the Central Water and Power Commission and the Survey of India was held in the Survey of India Office at Calcutta on 24th and 25th April 1962 to assess the survey work-load in connection with the development projects in the eastern region during the third and subsequent Five-Year Plan periods. COLONEL J. S. PAINTAL, Director, Eastern Circle and COLONEL J. N. SINHA, Deputy Surveyor General represented Survey of India.

A conference of the Chief Engineers of Andhra Pradesh, Gujarāt, Kerala, Madras, Mahārāshtra and Mysore States with the representatives of the Central Water and Power Commission and the Survey of India was held at Bangalore on the 7th and 8th May 1962 to assess the survey work-load in connection with the development projects in the southern region during the Third and subsequent Five-Year Plan periods. COLONEL J. N. SINHA, Deputy Surveyor General, while representing Survey of India, presided over the conference. SHRI L. J. BAGNALL, Director, Southern Circle also represented Survey of India.

Indo-Pākistān Boundary Demarcation.—MAJOR T. S. BEDI, Superintending Surveyor held discussions with his counterpart Mr. M. Rafique, Officer-in-Charge No. 7 Party, Survey of Pākistān at (*a*) Atāri/Wāgah border on the 25th April, 16th July, 10th October and the 7th November 1962, (*b*) Hindumalkot on the 17th November 1962, (*c*) Amritsar on the 29th November 1962 and the 30th March 1963 and (*d*) Lahore on the 7th December 1962.

BRIGADIER GAMBHIR SINGH, Surveyor General of India, accompanied by COLONEL S. K. S. MUDALIAR, Director, Northern Directorate, LT.-COLONEL N. K. SEN, Deputy Director (Eastern Sector), LT.-COLONEL Y. RAMACHANDRAN, Deputy Director (Tech.) and MAJOR T. S. BEDI, Officer-in-Charge, No. 27 Party, held discussions with officials of Survey of Pākistān at Delhi between the 10th and 13th September 1962 in connection with the demarcation of the Indo-Pākistān Boundary.

COLONEL S. K. S. MUDALIAR, Director, Northern Directorate accompanied by LT.-COLONEL N. K. SEN, Deputy Director (Eastern Sector) and MAJOR A. S. IYER, Officer-in-Charge, No. 12 Party, held discussions with the Deputy Surveyor General, Survey of Pākistān at Dacca on the 9th, 10th and 11th October 1962.

COLONEL S. K. S. MUDALIAR, Director, Northern Directorate, accompanied by MAJOR T. S. BEDI, Officer-in-Charge, No. 27 Party held discussions with the Rājasthān State Government Officials at Jaipur on the 9th April 1962 and attended a meeting with the Chairman, Board of Revenue, Ajmer on the 19th, 20th and 21st December 1962 in connection with the Rājasthān-West Pākistān Boundary demarcation.

MAJOR T. S. BEDI, Superintending Surveyor, held discussions with (*a*) the Financial Commissioner (Revenue) to the Government of Punjab at Chandigarh on the 16th January 1963 and (*b*) the Surveyor General of Pākistān and other Officials of Survey of Pākistān at Amritsar on the 13th March 1963.

LT.-COLONEL N. K. SEN, Deputy Director (Eastern Sector), Northern Directorate, accompanied by MAJOR D. M. GUPTA, Officer-in-Charge, No. 35 Party, attended a conference of Directors, Land Records & Surveys, East Pākistān and Tripura at Dacca between the 10th and 12th December 1962 in connection with Tripura-East Pākistān Border demarcation. He also held discussions with the Chief Commissioner and Chief Secretary, Tripura on the 15th and 18th January 1963. He, accompanied by the above Officers and LT.-COLONEL S. CHOUDHURI, Deputy Director (Central Sector), Northern Directorate, also attended a meeting at Agartala on the 16th and 17th January 1963 in connection with the same subject.

LT.-COLONEL S. CHOUDHURI, Deputy Director (Central Sector), Northern Directorate visited Calcutta on the 13th and 14th for discussions with the West Bengal Government Officials in connection with the Tripura boundary work and border surveys. He also held discussions with the Tripura Government Officials at Agartala on the 18th and 19th January 1963 in connection with the same subject.

COLONEL S. K. S. MUDALIAR, Director, Northern Directorate visited Chandigarh on the 19th January 1963 for discussions with the Punjab Government Officials. He, accompanied by MAJOR T. S. BEDI, Superintending Surveyor held discussions with the Officials of Survey of Pākistān at Amritsar on the 28th May 1962. He visited Lahore (West Pākistān) on the 6th February 1963 for discussions with Pākistān Government Officials and Tripura between the 18th and 20th February 1963 for attending a meeting with the Chief Secretary, Tripura.

LT.-COLONEL S. CHOUDHURI, Deputy Director (Central Sector), Northern Directorate, accompanied by MAJOR D. M. GUPTA, Officer-in-Charge, No. 35 Party and Shri H. K. Chopra, Officer Surveyor visited Akhaura (East Pākistān) on the 19th February 1963 to attend a conference with the Director of Land Records & Surveys, East Pākistān.

COLONEL S. K. S. MUDALIAR, Director, Northern Directorate accompanied by LT.-COLONEL Y. RAMACHANDRAN, Deputy Director, (Technical), Northern Directorate visited Jaipur on the 3rd March 1963 and held discussions in connection with Indo-West Pākistān Boundary demarcation. He also attended a conference with the Deputy Surveyor General of Pākistān at New Delhi between the 7th and 9th March 1963.

Institution of Surveyors (India).—COLONEL R. S. KALHA, Director, Map Publication visited Delhi on the 13th October 1962 to attend a meeting of the Institution of Surveyors. He visited Delhi

on the 5th and again on the 28th January 1963 for attending a meeting of the Institution of Surveyors and for discussions with the Ministries of the Government of India.

The Government of India have recognised provisionally a pass in the Final Examination held by the Institution of Surveyors in the three branches mentioned below for the purpose of recruitment to superior posts and services under the Central Government :—

(*i*) Land Surveying.
(*ii*) Hydrographic Surveying.
(*iii*) Building and Quantity Surveying.
(*iv*) Valuation Surveying.

Oceanic Research, Metric Committee, Physical Laboratory & Observatories.—LT.-COLONEL K. L. KHOSLA, Deputy Director, Geodetic and Research Branch visited Delhi on the 18th and again 29th May 1962 for discussions with the Indian National Committee for Oceanic Research and Standing Metric Committee.

LT.-COLONEL KHOSLA visited Bombay from the 27th and 29th of June 1962 for attending meetings of the Working Groups of the Indian National Committee for Oceanic Research and of the International Quiet Sun Year. He visited Hyderābād on the 10th and 11th July 1962 for attending a meeting of the Geophysics Research Board. During return journey, he stopped at Delhi on the 13th for discussions with the Ministry of Irrigation and Power, Indian Standards Institution and the Standing Metric Committee. He visited Delhi on the 27th and 28th July 1962 for attending a meeting of the Hydrographic Survey Committee of the National Harbour Board, and for discussions with the Ministry of Transport & Communications and the National Physical Laboratory. He visited Delhi on the 29th August 1962 for discussions with the Indian National Committee for Oceanic Research and the National Physical Laboratory. He visited Delhi on the 1st September 1962 for discussions with the Director General of Observatories and Member Secretary, Indian National Committee for Oceanic Research.

He visited Cochin between the 25th and 27th for visiting ships "Argo" and "Horizon" of the Scripps Institute of Oceanography, U.S.A. in connection with the Indian Ocean Expedition.

He visited Delhi on the 5th and 6th November 1962 for discussions with the National Physical Laboratory, National Archives and Indian National Committee for Oceanic Research.

He visited Delhi on the 8th and again on the 21st and 22nd January 1963 for discussions with the National Physical Laboratory and the Indian National Committee for Oceanic Research, the Director General of Observatories and the Director General of Lighthouses and Lightships.

He visited Bombay on the 10th January 1963 for discussions with the Director, Colaba & Alibag Observatories and the Officer-Commanding, Indian Naval Service "Investigator". He also visited

Marmagao between the 14th and 16th January 1963 for discussions with the Naval Officer-in-Charge, Goa, Officer-Commanding, Indian Naval Service "Jumna" and Port Administrative Officer.

Accommodation.—COLONEL J. A. F. DALAL, Director, Training Directorate visited Hyderābād between the 13th and 15th August 1962 for discussions with the Chief Secretary and Controller of Accommodation, Andhra Pradesh regarding accommodation for Training Directorate Office and its units.

COLONEL J. N. SINHA, Deputy Surveyor General visited Hyderābād between the 12 and 14th September 1962 for consultations with the Accommodation Controller, Hyderābād.

COLONEL J. A. F. DALAL, Director, Training Directorate called on GENERAL S. M. SHRINAGESH, Governor of Andhra Pradesh on the 23rd January 1963 and apprised him of the move of the Training Directorate in Hyderābād.

Miscellaneous.—A conference of the senior officers of the Survey of India and the Ministries of Scientific Research & Cultural Affairs and Finance was held at Dehra Dūn under the Chairmanship of DR. MONO MOHON DAS, Deputy Minister, Scientific Research and Cultural Affairs on the 2nd and 3rd July 1962. All the officers of the Survey of India of and above the rank of Deputy Director including COLONEL O. P. ANAND, Director, on temporary reversion to Military duty participated. The Ministries were represented by the following officers :—

(*i*) SHRI M. G. RAJA RAM, I.A.S., Joint Secretary.

(*ii*) SHRI M M. KUSARI, I.A.S., Deputy Secretary.

(*iii*) SHRI N. K. SREENIVASAN, Under Secretary.

(*iv*) SHRI B. N. CHADHA, Assistant Financial Adviser, Ministry of Finance.

Various problems concerning Survey of India were discussed in the conference.

BRIGADIER GAMBHIR SINGH, Surveyor General of India visited Calcutta on the 11th and 12th July 1962 for attending the meeting of the Advisory Board for National Atlas and Geographical Names.

COLONEL R. S. KALHA, Director, Map Publication visited Delhi on the 17th September 1962 for discussions with the Ministry of External Affairs.

COLONEL R. S. KALHA, Director, Map Publication visited Delhi between the 3rd and 5th October 1962 to attend the 7th meeting of the Organisation & Methods Institute Sectional meeting Indian Standards Institution, New Delhi.

COLONEL J. N. SINHA, Deputy Surveyor General visited Delhi on the 15th and 16th and again on the 26th October 1962 for discussions with the Ministry of Scientific Research and Cultural Affairs and to attend a meeting of Border Roads Development Board.

LT.-COLONEL K. L. KHOSLA, Deputy Director, Geodetic and Research Branch visited Delhi between the 3rd and 5th October 1962 for attending a meeting at the Indian Standards Institution and for discussions with Director General Lighthouses and Lightships. He also visited Bombay on the 9th October 1962 and attended the inauguration of the First Scientific Cruise of Indian Naval Service "Kistna" in connection with the Indian Ocean Expedition.

COLONEL J. S. PAINTAL, Director, Eastern Circle gave a talk on "Topographical and Cadastral Survey in India" at the joint settlement training camp of Indian Administrative Service, Indian Police Service and West Bengal Civil Service Officers at Bandel on the 11th January 1963.

COLONEL J. S. PAINTAL, Director, Eastern Circle and LT.-COLONEL M. M. DATTA, Deputy Director (Photogrammetry), Northern Directorate attended the 7th Indian Standards Convention at Calcutta from the 28th January to 2nd February 1963 as official delegates from the Survey of India.

At the request of the Director, Technical Education, Andhra Pradesh, Hyderābād, COLONEL J. A. F. DALAL, Director, Training Directorate visited the Government Polytechnic on the 31st March 1963 and gave a short talk to the staff and the students on the Survey of India and the employment opportunities it offers to Diploma holders in Civil Engineering.

10. **Appointments in Committees, etc.**—COLONEL S. K. S. MUDALIAR, Director, Northern Directorate was appointed as a corresponding member from India to the Standing Committee of of the Commonwealth Survey Officers Conference.

LT.-COLONEL N. K. SEN, Deputy Director (Eastern Sector), Northern Directorate was appointed as Director of Land Records & Surveys, Tripura, in addition to his own duties, with effect from the 27th September 1962.

11. **Honours & Awards.**—In the 8th State awards for excellence in printing and designing books and other publications, 1962, the Survey of India won a "Certificate of Merit" for publishing "School Atlas". COLONEL R. S. KALHA, Director, Map Publication attended the prize distribution function.

On his being elected as a Fellow of the Royal Astronomical Society, London, SHRI J. C. BHATTACHARJEE (Class II) was personally congratulated by DR. MONO MOHON DAS, Deputy Minister, Scientific Research and Cultural Affairs who also conveyed to him the appreciation of the Government of India.

In recognition of their specially arduous and meritorious survey work in Priority I Area and Indo-Pākistān Boundary demarcation during the year 1961-62, SARVA SHRI R. L. TANEJA and D. D. MEHTA, Surveyors and D. C. KUTHARI, Survey Assistant were granted Certificates of Honour. They along with 28 other Class III & Class IV personnel were granted Honorarium also.

12. **Personnel.**—Retirements, casualties, promotions, appointments, etc.

Class I Service.—SHRI E. R. WILSON, B.A., M.I.S., Officiating Surveyor General of India—retired.

SHRI P. A. THOMAS, F.R.I.C.S., M.I.S., Director—retired.

SHRI F. M. HAWLEY, Superintending Surveyor—retired.

MAJOR P. M. MANI, Superintending Surveyor and CAPTAIN S. N. DIMRI, Deputy Superintending Surveyor—temporarily reverted to Military Duty.

SHRI SHAM LAL MALLICK, Senior Scientific Officer—joined Indian Institute of Technology, Kanpur.

MAJORS S. CHOUDHURI, Y. RAMACHANDRAN and Y. L. KHULAR, Superintending Surveyors—promoted temporarily to officiate as Deputy Directors and granted the local rank of Lt.-Colonel.

CAPTAINS L. P. SHARMA, V. S. DAVE and S. M. CHADHA, Deputy Superintending Surveyors—promoted to officiate as Superintending Surveyors and granted the local rank of Major.

SARVA SHRI SURESH PRASAD, R. L. GHEI, D. BISWAS, J. E. DAVID, A. K. BHATTACHARJEE and M. N. KUTTY, Officer Surveyors—promoted to officiate as Superintending Surveyors.

CAPTAINS RANVIR SINGH, G. K. ROY, P. S. VENKATARAMAN, A. P. RASTOGI, D. P. GUPTA and LIEUTENANT C. B. JHALDIYAL—posted to Survey of India.

SHRI B. M. LAL, Officer Surveyor—appointed to officiate as Deputy Superintending Surveyor.

SHRI M. K. CHATTERJEE, Officer Surveyor—promoted to officiate as Officer-in-Charge, Map Record and Issue Office.

Class II Service.—SARVA SHRI K. K. RAMPAL and SISIR BHANJA, Officer Surveyors—resigned.

SHRI A. L. SOOD, Eelectrical Engineer—retired.

SARVA SHRI RAN BAHADUR SINGH, S. C. CHATURVEDI, N. D. SHARMA, V. K. VERMA, SURESH CHANDRA, M. C. MITTAL, N. K. AGARWAL, FAHIM BASIR, S. C. SURI and R. S. SAWHNEY—appointed as Officer Surveyors.

SARVA SHRI N. M. BOPAIAH, L. R. HOWARD, J. B. MATHUR and N. C. NAUG, Officer Surveyors—granted extension.

SHRI B. P. RUNDEV, Officer Surveyor—re-employment extended.

SHRI J. N. KOHLI, retired Officer Surveyor—re-employed.

DR. M. M. SARKAR, M.B.B.S.—appointed as Medical Officer-in-Charge, Western Circle Dispensary.

Class III (Division I) Service.—SHRI K. GANESAN, Surveyor—resigned.

SHRI S. K. BANERJI, Surveyor, Grade II—resigned.

SHRI R. N. RAMANATHAN, Surveyor, Grade II—removed from Service.

SHRI S. VATSA, Topo Trainee Type 'A'—joined Indian Military Academy, Dehra Dūn.

SHRI DEEP CHAND, Topo Trainee Type 'A'—joined Railway Technical School, Jawalapur.

SARVA SHRI M. L. ROY CHOWDHURI, V. V. GOKHALE, T. R. HITHESI, Topo Trainees Type 'A'—resigned.

SARVA SHRI JAIKIRTI SINGH, Survey Assistant (Selection Grade), L. R. A. RAHIM BEIG, Survey Assistant and KARAN SINGH, Draftsman, Division I—retired.

SARVA SHRI GOVIND PRASAD, Surveyor (Selection Grade), BHOLA DATT and K. A. P. MATHUR, Survey Assistants (Selection Grade)—granted extension.

SARVA SHRI S. C. DHAR, PADAM SINGH, UDAI RAM, JAI PRAKASH and MADHWA NAND, Survey Assistants—granted extension.

SHRI I. M. SAKLANI, Survey Assistant—re-employment extended.

SARVA SHRI R. K. LAL and C. M. AZIMUDDIN, Survey Assistants (Selection Grade)—re-employment extended.

SARVA SHRI R. P. KUKRETI and UDAI SINGH, Survey Assistants—promoted to officiate in the Selection Grade.

SARVA SHRI K. A. N. RAO, K. ANANTHANARAYAN, G. N. RAMANNA, K. C. N. RAO, K. G. ATRI, G. N. UPADHAYA, V. P. G. RADHAKRISHANAN, P. E. MATHEW, K. GANESAN, K. L. V. KRISHNAMURTHY and S. D. SILVA, Surveyors, Grade II—promoted to officiate as Surveyor, Ordinary Grade.

SARVA SHRI D. K. MANDAL, RAM SINGH, SATNAM SINGH II, M. L. SHARMA, B. GHILDIYAL, SASHINDRA KUMAR, K. N. G. PILLAI, G. L. SEHGAL, J. S. TOMAR, KHUSHI RAM, S. R. MUKHERJEE, D. P. GHOSH, A. K. SARKAR, K. S. GOPALAKRISHAN, V. B. BHASIN, M. K. CHENGAPPA, J. H. DAS, M. K. SANKARAN, M. DASARATHY, M. K. GUHA, D. K. CHOWDHURY, S. R. BISWAS, SUKUMAR DAS and S. D. CHATTERJEE, Topo Trainees Type 'A'—promoted to officiate as Surveyors, Grade II.

SARVA SHRI B. S. RAJPUT, K. K. SHARMA, HANS RAJ, RAM LAL, B. M. L. SHARMA, K. S. HOODA, S. G. AGARWAL, S. D. DHADPHALE, B. S. RAWAT, T. N. SHARMA, U. P. S. SURULIVEL, P. N. POVAYA, M. L. ROY CHOUDHURI, TILAK RAJ, PROMODE CHANDRA, RAVI MOHAN, MAHENDRA SINGH, H. R. AICH, JAGDISH KUMAR, P. V. G. PANIKKAR, INDRA JIT, MOHANJIT SINGH, A. K. SARKAR, G. MUKHERJEE, J. K. DAS, R. L. KAPRUWAN, S. N. DATTA, J. N. ANEJA, SUDARSHAN LAL, V. V. GOKHALE, N. SRINIVASAN, J. C. AHUJA J. M. SHARMA, B. K. MUNJAPPA RAI, M. K. BIJANI, K. G. RAO

D. S. NARAYANKAR, L. S. SHARMA, MALOOK SINGH, K. L. DEO, M. M. JAIN, B. L. CHOUDHURY, S. S. RAWAT, T. N. NAITHANI, D. R. SHARMA, JAGDISH CHANDRA, R. P. SINGH, K. S. PANWAR, J. B. PAWSEY, S. N. KUMAR, P. C. KUNDALIA, CHIMAN LAL, N. C. ROY, A. G. JOSHI, A. RAMA RAO, K. R. ARORA, PRITAM SINGH, O. P. GUPTA, D. N. PANDEY, K. L. KARARHA, S. S. RAWAT, A. SUBBARAYUDU, A. M. FAHIMUDDIN, G. K. LALA, R. K. MITTAL, S. S. UPPAL, M. S. BHASIN, S. N. JUGRAN, M. V. CHIDMABARA, A. K. BISWAS, R. D. CHAKRAVARTY, J. S. KEER, S. M. SIVAMOORTY, G. B. NEELAMMANAVAR, CHAMAN LAL, D. S. CHOHAL, C. J. L. J. RAO, M. L. CHHABRA, SUKH DEV, T. APPUKULTAN, M. S. RAWAT, S. B. MAMGAIN, D. V. S. KUMAR, D. P. BADONI, K. R. V. MURTHY, S. M. UNIYAL, P. R. SHARMA, MAWASI RAM, B. K. SAHNI, S. NAGARAJAN, A. N. GURJAR, R. R. HOSKOT, BOOTA RAM, B. BALASUBBAIAH, M. S. KEER, M. R. BHIDE, K. H. BABU, D. JAYANANDAM, V. U. RAO, SHYAM SINGH THAPLI, RAM PRAKASH, PARSHOTAM DAS, N. C. BALHAR, B. S. RAWAT, P. L. CHOPRA, R. K. KAMBOJ, A. K. UNIYAL, Y. R. RAO, R. L. VAID and N. C. JAIN—appointed as Topo Trainees Type 'A'.

SARVA SHRI SOHAN SINGH, K. C. VARUGHESE, K. M. KUKRETI, M. S. GURKHA, C.H. and C. B. GURUNG, Class III, Division II personnel—promoted to officiate as Survey Assistants.

SARVA SHRI J. M. C. EDWARDS, B. S. BARTHWAL, P. S. BIST, T. S. RANA and G. L. SHARMA, Class III, Division II Draftsman—promoted to officiate as Draftsman Division I.

SHRI W. D. SHARMA, Storekeeper—promoted to officiate as Stores Assistant.

SHRI J. S. BIST, a Military Pensioner—re-employed as Security Supervisor.

SHRI N. S. THAPA, Ex-serviceman—appointed as Security Supervisor.

Class III, Division II and Ministerial Staff:—

495	..	appointed.
89	..	resigned and discharged.
7	..	retired.
5	..	transferred.

13. **Deaths.**—MAJOR-GENERAL G. CHEETHAM, C.B., D.S.O., M.C., who came to India recently as the Chairman of the Reviewing Committee for the Survey of India and the National Atlas Organisation.

SHRI M. N. PANDEY, Air Survey Draftsman.

SHRI B. LYNGDOH, Plane-tabler.

SHRI L. C. CHAKRABORTY, Clerk, Upper Division.

SHRI B. BANERJEE, Clerk, Lower Division.

Class IV personnel—17.

II. ABSTRACT OF SURVEYS AND TOPOGRAPHICAL WORK

14. The following tables indicate the progress achieved in the topographical surveys in the country :—

Table A.—Progress of Topographical Surveys in metric system since 1956

Survey Years	1 : 50,000 and larger scales		Total
	Original Surveys	Revision Surveys of area previously on 1-inch and larger scales	
	sq. km	sq. km	sq. km
Total to 1962 ..	2,19,476	95,035	3,14,511
1962–63	**21,322**	**31,382**	**52,704**
Total to **1963** ..	**2,40,798**	**1,26,417**	**3,67,215**
Balance	8,73,813*	20,27,062†	29,00,875
Total Programme ..	**11,14,611**	**21,53,479**	**32,68,090‡**

* 9,635 sq. km of this balance have, since 1905, been surveyed on $\frac{1}{4}$-inch scale and 4,77,469 sq. km on $\frac{1}{2}$-inch scale.

† 2,831 sq. km of original survey and 4,961 sq. km of revision survey in F.P.S. System on 1-inch and larger scales of this balance were also completed during the period under report.

‡ Total area of the Indian Union excluding Sikkim (area 7,107 sq. km) and Bhutān (area 40,244 sq. km).

Table B.—Revision of above work

Survey Year	1 : 50,000 and larger scales	Total
1962–63 ..	49 sq. km	49 sq. km

Table C, which shows in detail the survey operations carried out during the period under report together with their cost rates, appears at the end of this section (p. 30).

Abstract of Surveys

15. Although the primary responsibilities of the Survey of India are geodetic and topographical surveys and compilation of geographical maps, the department has to undertake a considerable amount of special surveys in connection with irrigation, hydro-

electric, land reclamation, flood control and similar development projects and to meet demands for large scale surveys of cities, cantonments and important industrial areas. It has also to advise and assist the State Governments in local and settlement surveys as may be required. Since World War II, surveys for irrigation and similar projects had largely occupied the resources of the Survey of India, but since the year 1954–55, a fair amount of the departmental resources is being employed on departmental work.

The following sub-heads show the various types of work and field operations carried out by the department during the preiod :—

Boundary Surveys	Topographical framework
Photo-mosaics	Topographical Surveys by air-cum-ground methods
Geodetic framework	Flood Control Surveys
Rectangulation	Training
Levelling	

During the current year, a good amount of progress has been made in the departmental topographical surveys in metric system.

An abstract of surveys in each State/Union Territory of the Indian Union alphabetically arranged, is given below.

16. Andhra Pradesh.

Topographical surveys by ground methods.—1 : 50,000 blue-print survey for the Landing Chart of Warangal Aerodrome in Warangal District (p. 93).

1 : 25,000 original ground survey for departmental mapping in Anantapur District (p. 95).

$\frac{1}{4}$-inch verification of office copy corrections for the Approach Chart of Warangal Aerodrome in Karimnagar and Warangal Districts (p. 93).

Topographical survey by air-cum-ground method.—Photo verification and height control on 2-inch air photographs for Balimela Reservoir in Vishākhapatnam District (p. 91).

Topographical framework.—Triangulation for the Landing Chart of Warangal Aerodrome in Warangal District (p. 92).

Triangulation for 1 : 4,000, 1 : 25,000 and 1 : 50,000 surveys in training areas, in Hyderābād and Nalgonda Districts (p. 124).

Subsidiary triangulation for 1 : 25,000 original survey in Anantapur District (p. 97).

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III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 27 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**NORTHERN DIRECTORATE**
	Boundary Surveys Rājasthān/Punjab (India)-West Pākistān Boundary Demarcation—4-inch scale without contours					
***Mainly** undeveloped area with sand dunes*	Theodolite traverse and boundary demarcation	5·1 linear km	4·4 linear km	543·5 per linear km	659·9 per linear km	
	Boundary verification	1,036·7 linear km	72·4 linear km	421·3 per linear km	505·6 per linear km	
	Fair mapping	92·5	..	87·8	109·6	
***Mainly** covered with seasonal cultivation and fairly well inhabited*	Boundary verification and reconnaissance/relaying of missing pillars	551·2 linear km	59·6 linear km	157·1 per linear km	188·5 per linear km	
No. 20 (Photo) Party.—						
	Sone High Level Canal Project Survey—4-inch scale, contours at 1 foot V.I.					
Cultivated plains with scattered trees fairly well populated	Fair mapping	259·0	67·6	12·2	15·9	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 20 (Photo) Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**NORTHERN DIRECTORATE.—*Contd.***
	Delhi Regional Plan Survey—3-inch scale, contours at 10 feet V.I.					
Densely populated cultivated plains	Fair mapping	362·6	37·8	11·8	15·3	
	Delhi Regional Plan Survey—6-inch scale, contours at 5 feet V.I.					
Densely populated cultivated plains	Fair mapping	145·0	38·8	11·5	14·9	
No. 26 (Photo) Party.—						
	Nāgārjunakonda Excavated Sites Survey—scale 1 : 8,000, contours at 5 feet and 25 feet V.I.					
Open and undulating with a few scattered village sites	Fair mapping	31·0	3·4	109·0	141·7	
No. 12 Party.—						
	Submergence Survey in Mizo District—4-inch scale, contours at 10 feet V.I.					
Hilly areas with ravines covered with dense jungle	Air survey	19·5	1·3	163·0	211·9	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 12 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**NORTHERN DIRECTORATE.—*Contd.***
	Boundary Survey, Assam-East Pākistān Boundary surveys—4-inch scale, contours at 10 feet and 20 feet V.I.					
Intricate hills covered with dense jungle mainly bamboos	Air survey	205·7	9·4	105·6	131·9	
No. 35 Party.—						
	Topographical Surveys—4-inch scale, contours at 10 feet and 20 feet V.I. Karnaphuli Submergence area—Joint Indo-Pākistān Survey					
Intricate low hills with dense mixed jungle mainly bamboos	Triangulation and its computations	176·1	57·4	74·9	108·5	
	Theodolite traverse and its computations	139·0 linear km	16·5 linear km	298·0 per linear km	401·4 per linear km	
	Plane-tabling	15·0	0·9	4,049·5	5,853	Original survey.
	Photo verification and height control	26·9	18·3	166·7	236·1	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 35 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**NORTHERN DIRECTORATE.—*Concld.*** **(Central Sector)**
	Boundary Survey					
	Joint Indo-Pākistān Boundary demarcation—Tripura-Sylhet Sector					
Undulating low hills with dense vegetation and cultivated open valleys	Theodolite traverse and its computations	84·8 linear km	8·7 linear km	583·9	766·7	High cost due to joint boundary work.
Densely wooded hilly, intricate terrain	Verification survey	15·8	3·7	589·2	790·6	On grey prints of the existing 1-inch maps.

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 7 Party.—	**Manipur Valley Development Project—4-inch scale, contours at 3 feet and 30 feet V.I.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE**
Partly open cultivated plains interspersed with low hills and swamps and partly high hills with dense jungle	Supplementary triangulation ..	155·4	101·3	26·4	47·3	Cost includes field computations.
	Theodolite traverse	51·3 linear km	17·7 linear km	96·3 per linear km	149·5 per linear km	Cost includes field computations.
	Photo verification on 2-inch scale	801·6	136·2	20·9	38·4	Low out-turn and high cost in triangulation and ground verification due to late start of work and unfavourable weather conditions.
	Photo verification and height control on 2-inch scale.. ..	171·4	34·7	14·4	18·8	
	Double tertiary levelling ..	308·7 linear km	31·4 linear km	60·2 per linear km	95·7 per linear km	Cost includes field computations.
	Single tertiary levelling ..	791·2 linear km	101·4 linear km	15·7 per linear km	24·9 per linear km	Cost includes field computations.

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 7 Party.—*Contd.*	**Kosi Irrigation Project—4-inch scale, contours at 1 foot V.I.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Contd.***
Cultivated plains with fairly dense vegetation and interspersed with water channels	Photo verification on 2-inch scale	341·6	67·9	23·0	46·7	
	Double tertiary levelling ..	109·1 linear km	31·4 linear km	65·7 per linear km	112·4 per linear km	Cost includes field computations.
	Single tertiary levelling ..	199·9 linear km	43·5 linear km	50·2 per linear km	85·9 per linear km	Cost includes field computations.
	Sasangada Iron Ore Deposits Project—1 : 5,000 scale, contours at 8 metres V.I.					
Low hills covered with dense jungle ..	Supplementary triangulation ..	36·2	17·1	116·9	173·4	Cost includes field computations.
	Theodolite traverse	21·7 linear km	29·6 linear km	65·0 per linear km	96·7 per linear km	Cost includes field computations.
	Ground verification and height control on 1 : 10,000 scale ..	28·7	4·9	505·4	759·0	Low out-turn and high cost due to heavy jungle clearance involved.
	Air survey of planimetry on 1 : 10,000 scale	28·7	39·1	38·5	50·2	Original survey.

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 7 Party.—*Contd.*	**Ramman River Project—1 : 12,500 scale, contours at 10 metres V.I.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Contd.***
Steep hill slopes partly covered with terraced cultivated fields and partly with open scrub and scattered trees	Supplementary triangulation ..	41·4	55·4	125·3	173·1	Cost includes field computations.
	Ground verification and contouring	7·8	3·9	794·6	1256·8	Low out-turn and high cost due to late start of field and unfavourable weather conditions.
	Air survey of planimetry on 1½-inch scale	7·8	16·8	45·0	58·3	
	Rinchingtong River Project—1 : 12,500 scale, contours at 10 metres V.I.					
Steep hill slopes partly covered with tea plantation and partly with dense jungle	Supplementary triangulation ..	38·8	55·4	53·5	73·9	Cost includes field computations.
	Ground verification and contouring	0·5	0·8	627·4	1032·0	Low out-turn and high cost due to late start of field and unfavourable weather conditions.
	Air survey of planimetry on 1½-inch scale	0·5	3·1	144·8	194·0	Original survey.

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 7 Party.—*Concld.*	**Departmental Surveys—1:50,000 scale, contours at 20 metres V.I.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Contd.***
Gently undulating plains with fairly dense vegetation mostly cultivated areas	Air survey of planimetry on 2-inch scale	1,422·0	284·4	7·9	10·2	Original survey.
	Fair mapping	4,237·0	141·2	15·2	19·7	
	Computations	6,369·0	266·3	1·1	1·5	
No. 11 Party.—	**Flood Control Investigations Surveys—Levelling and Pricking of heighted positions on air Photographs**					
	Preparation of spot-heighted air photo-mosaics on 4-inch scale ..	4,002·0	78·5	5·5	7·1	
	Computations	5,987·0 linear km	317·9 linear km	1·2 per linear km	1·6 per linear km	
	Compilation of levelling data ..	3,965·0	473·9	1·9	2·5	
	Kangsabati Commanded Area—2-inch scale with contours at 2 feet V.I.					
Undulating ground partly open and cultivated and partly covered with dense scrub and jungle	Double tertiary levelling ..	417·3 linear km	43·3 linear km	29·9 per linear km	48·5 per linear km	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 11 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Contd.***
	Single tertiary levelling ..	1,562·3 linear km	67·2 linear km	19·6 per linear km	30·5 per linear km	
	Theodolite traverse	122·5 linear km	49·7 linear km	29·4 per linear km	45·9 per linear km	
	Ground verification and height control	777·0	57·3	15·6	26·9	
	Field computations	777·0	79·0	3·4	5·8	
	Bhāgirathi Project					
Cultivated flat plains with numerous trees and village sites	Double tertiary levelling ..	341·5 linear km	74·8 linear km	22·3 per linear km	35·4 per linear km	
	Theodolite traverse	583·3 linear km	61·2 linear km	38·1 per linear km	62·2 per linear km	
	Field computations (Double tertiary levelling)	341·5 linear km	227·6 linear km	1·2 per linear km	2·0 per linear km	
	Field computations (Traverse) ..	583·3 linear km	80·6 linear km	4·1 per linear km	6·2 per linear km	

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† Overall cost is the net cost plus the cost incurred on moving the party *to and from the field* and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 11 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Contd.***
	Farakka Project.					
Flat swampy plains with mango groves and village sites	Double tertiary levelling ..	31·4 linear km	104·7 linear km	28·6 per linear km	47·6 per linear km	
	Theodolite traverse	40·2 linear km	70·9 linear km	69·6 per linear km	114·7 per linear km	
	Mokameh Project					
Flat cultivated plains with numerous village sites and fairly dense vegetation	Double tertiary levelling ..	329·1 linear km	60·2 linear km	13·4 per linear km	24·7 per linear km	
	Theodolite traverse	301·9 linear km	51·2 linear km	29·8 per linear km	52·4 per linear km	
	Field computations (Double tertiary levelling)	329·1 linear km	197·5 linear km	1·6 per linear km	2·6 per linear km	
	Field computations (Traverse) ..	301·9 linear km	59·2 linear km	6·1 per linear km	9·4 per linear km	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 18 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—** ***Contd.***
	I.C.A.O. Survey—Approach Chart —1:250,000 scale, contours at 100 metres V.I. for Mālda, Bālurghāt, Cooch Behār and Rupsi Aerodromes					
Flat, open, cultivated plains interspersed with jungle patches	Verification surveys	7,681·9	1,363·3	1·4	2·0	
	I.C.A.O. Landing Chart Survey 1:50,000 scale, contours at 20 metres V.I. for Mālda, Bālurghāt, Cooch Behār and Rupsi Aerodromes					
Flat area with cultivation and open jungles	Theodolite traverse	300·3 linear km	44·2 linear km	42·7 per linear km	59·5 per linear km	
	Double tertiary levelling ..	32·0 linear km	50·3 linear km	48·0 per linear km	67·2 per linear km	
	Single tertiary levelling ..	197·3 linear km	82·9 linear km	46·8 per linear km	65·4 per linear km	
	Blue-print revision survey ..	169·9	17·4	80·8	113·2	
	Computation and miscellaneous ..	169·9	17·0	10·3	13·4	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 18 Party.—*Contd.*	**Umtru Project Surveys, Stages IV and V—2-inch scale, contours at 20 feet V.I**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Contd.***
Densely wooded and intricate hills	Triangulation	129·5	86·0	53·1	77·6	
	Ground verification and contouring	128·9	6·1	282·3	410·1	
	Computations and miscellaneous..	129·5	8·6	39·7	51·6	
	Grid Layout of Patratu Thermal Power Station					
Open and undulating country	Rectangulation	8 hectares	3 hectares	109·0 per hectare	142·0 per hectare	
	Computations and miscellaneous ..	8 hectares	1 hectare	136·0 per hectare	173·0 per hectare	
	Kangsabati & Dwarkeshwar Valley Project & Lower Kangsabati Reservoir Surveys—2-inch scale, contours at 10 feet V.I.					
Open and undulating country	Fair mapping	181·3	13·0	29·8	38·7	
	Press order proof corrections and miscellaneous work ..	522·1	12·4	14·5	18·8	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 18 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**EASTERN CIRCLE.—*Concld.***
	Upper Umiam Surveys/Mawphlong Hydel Project—2-inch scale, contours at 20 feet V.I.					
Hilly area covered with open jungle and with steep gorges astride Umiam River	Computations and miscellaneous ..	12·0	0·3	88·0	114·4	
	Fair mapping	10·1	0·3	156·8	203·9	
	Umiam Hydel Project, Stage III—2-inch scale, contours at 20 feet V.I.					
Densely wooded, intricate hills and sparsely populated	Computations and miscellaneous ..	12·8	0·3	142·7	185·5	
	Fair mapping	12·8	0·4	105·5	137·1	
	Salandi Irrigation Project & Orissa Coast Canal Surveys—2-inch scale, contours at 2 feet V.I.					
Open flat coastal areas with numerous villages	Press order proof corrections ..	611·0	61·1	5·2	6·8	

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III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE**
	Narmada Commanded Area—2-inch scale, contours at 2 feet V.I.					
Mostly open, gently undulating and cultivated plains	Air survey and fair mapping.. ..	1,282·9	15·1	53·0	68·8	
	Balimela Dam—8-inch scale, contours at 5 feet V.I.					
River banks and low hills covered by dense jungle	Triangulation	5·7	11·4	354·4	546·2	
	Theodolite traverse	4·0 linear km	24·0 linear km	112·2 per linear km	173·0 per linear km	
	Single tertiary levelling ..	10·8 linear km	64·8 linear km	21·0 per linear km	32·0 per linear km	
	Plane-tabling ..	5·7	1·6	850·5	1,310·9	Original survey.
	Balimela Tunnel—4-inch scale, contours at 10 feet V.I.					
Intricate, low hills covered by dense jungle	Theodolite traverse	20·3 linear km	11·5 linear km	234·4 per linear km	361·3 per linear km	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	Double tertiary levelling ..	44·9 linear km	16·4 linear km	79·8 per linear km	123·8 per linear km	
	Single tertiary levelling ..	5·9 linear km	12·6 linear km	106·5 per linear km	164·2 per linear km	Work mainly carried out across steep hill slopes.
	Plane-tabling ..	13·1	2·2	609·9	940·1	Original survey.
	Balimela Reservoir—2-inch scale, contours at 10 feet V.I.					
***River** banks covered by dense jungle*	Photo verification and height control	72·5	15·3	131·9	203·3	
	Balimela Commanded Area					
Low hills covered by dense jungle interspersed with small patches of cultivation	Triangulation	512·0	102·4	19·3	29·7	
	Theodolite traverse	65·6 linear km	16·3 linear km	123·9 per linear km	190·9 per linear km	
	Double tertiary levelling ..	245·1 linear km	33·6 linear km	40·1 per linear km	61·8 per linear km	
	Single tertiary levelling ..	258·7 linear km	71·9 linear km	18·7 per linear km	28·9 per linear km	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—*Contd.*	**Warangal Aerodrome**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
Open, undulating plains with isolated, rocky hills	Triangulation	43·4	86·8	16·7	22·5	
	Double tertiary levelling ..	236·6 linear km	61·2 linear km	16·1 per linear km	21·8 per linear km	
	Single tertiary levelling ..	5·2 linear km	78·0 linear km	12·7 per linear km	17·1 per linear km	
	Blue-print revision survey ..	43·4	32·6	30·4	41·0	
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Open, cultivated plains and isolated, low hills	Verification survey (½-inch scale) ..	2,030·6	2,030·6	0·5	0·7	
	Trivandrum Aerodrome					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
80% built-up area, 20% coconut groves on sea shore	Triangulation	23·0	38·3	27·7	42·1	
	Theodolite traverse	2·9 linear km	28·0 linear km	37·9 per linear km	57·6 per linear km	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	Double tertiary levelling ..	17·5 linear km	87·5 linear km	12·1 per linear km	18·4 per linear km	
	Single tertiary levelling ..	7·4 linear km	74·0 linear km	14·3 per linear km	21·8 per linear km	Work was done mainly across sandy area.
	Blue-print revision survey ..	23·0	32·9	32·3	49·1	
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Low, undulating hills covered by dense jungle	Verification survey (¼-inch scale) ..	1,127·2	1,470·6	0·7	1·1	
	Tiruchchirāppalli Aerodrome.					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
60% undulating, cultivated plains, 40% built-up area	Triangulation	44·9	89·8	18·5	26·0	
	Single tertiary levelling ..	6·0 linear km	180·0 linear km	6·9 per linear km	10·8 per linear km	
	Blue-print revision survey ..	44·9	64·0	21·6	30·9	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Open, cultivated plains with isolated, low hills	Verification survey (¼-inch scale) ..	2,237·9	2,034·4	0·6	0·9	
	Madurai Aerodrome.					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
Open, cultivated plains with isolated, rocky hills	Triangulation	40·3	50·4	68·5	102·1	
	Double tertiary levelling ..	28·6 linear km	143·0 linear km	24·1 per linear km	36·0 per linear km	
	Single tertiary levelling ..	15·2 linear km	152·0 linear km	11·4 per linear km	16·9 per linear km	
	Blue-print revision survey ..	40·3	55·0	31·4	46·8	
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
	Verification survey (¼-inch scale) ..	2,030·6	2,030·6	0·9	1·3	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—*Contd.*	**Belgaum Aerodrome**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
Low, undulating hills interspersed with patches of cultivation	Triangulation	43·8	87·6	24·0	34·0	
	Double tertiary levelling ..	16·6 linear km	83·0 linear km	17·3 per linear km	24·5 per linear km	
	Blue-print revision survey ..	43·8	65·7	21·9	30·9	
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Partly jungle covered hills and partly open cultivated plains	Verification survey (¼-inch scale) ..	2,295·6	1,812·3	0·8	1·1	
	Mysore Aerodrome					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
Open, undulating, cultivated plains	Triangulation	40·0	31·7	61·4	85·7	
	Double tertiary levelling ..	189·2 linear km	39·7 linear km	40·0 per linear km	54·4 per linear km	
	Single tertiary levelling ..	5·6 linear km	56·0 linear km	27·6 per linear km	38·5 per linear km	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	Blue-print revision survey ..	40·3	40·3	38·4	53·6	
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
90% cultivated plains, 10% low hills	Verification survey (½-inch scale) ..	2,030·6	1,740·5	0·9	1·2	
	Bangalore Aerodrome					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
30% undulating country, 70% built-up area	Triangulation	103·2	206·4	8·3	10·8	
	Theodolite traverse	3·7 linear km	37·0 linear km	46·1 per linear km	60·0 per linear km	
	Single tertiary levelling ..	22·3 linear km	111·5 linear km	15·3 per linear km	19·9 per linear km	
	Blue-print revision survey ..	103·2	103·2	16·5	21·5	
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Cultivated plains with low hills all around	Verification survey (½-inch scale) ..	2,465·2	4,622·2	0·4	0·5	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—*Contd.*		sq. km	sq .km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	Bilāspur Aerodrome					
	Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
Undulating plains covered by low grass	Triangulation	40·3	30·2	83·9	118·7	
	Fixing of control points for Government of Kerala					
Low hills covered by teak and cardamom plantations	Triangulation	2 points	1 point	1,533·5	1,993·6	To check the linear accuracy of survey done by Kerala Government.
	Departmental Surveys—1 : 50,000 scale, contours at 20 metres V.I.					
Open cultivated plains	Fair mapping	738·6	73·9	3·5	4·5	
	Departmental Surveys—1 : 25,000 scale, contours at 10 metres V.I.					
Steep hills of the Western Ghats and undulating coastal belt covered by coconut and cashewnut groves	Triangulation	3,716·0	190·6	15·0	21·1	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 8 Party.—*Concld.*	**Tikarpāra Dam—8-inch scale, contours at 5 feet V.I. up to 300-foot contours, 10 feet V.I. between 300-foot and 500-foot contours and 25 feet V.I. above 500-foot contours**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
Low, undulating hills covered by open, mixed jungle interspersed with patches of cultivation	Triangulation	22·0	28·7	95·5	151·9	
	Theodolite traverse	42·4 linear km	31·0 linear km	84·0 per linear km	133·5 per linear km	
	Double tertiary levelling ..	90·5 linear km	33·5 linear km	52·2 per linear km	83·1 per linear km	
	Single tertiary levelling ..	41·4 linear km	73·1 linear km	24·0 per linear km	38·1 per linear km	
	Plane-tabling	22·0	1·4	1,238·8	1,970·3	Original survey.
No. 17 Party.—	**Narmada Reservoir—4-inch scale, contours at 20 feet V.I.**					
Partly undulating and partly hilly with fairly dense jungle and scattered patches of cultivation	Fair mapping	410·3	..	230·1	299·2	
	Complete job	410·3	..	567·9	992·9	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 17 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	Mangalore Aerodrome					
	Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
Mainly undulating with deep valleys having intensive cultivation and plantation—like palm, coconut and cashewnut	Triangulation computations ..	129·5	124·0	16·6	24·8	Job completed.
	Departmental Original Surveys—1:25,000 scale, contours at 10 metres V.I.					
Open, gently undulating and cultivated plains with flat, jungle covered, moderately high hills in the south	Ground verification and contouring	1,126·0	13·0	59·9	120·9	
	Departmental Original Surveys—1:25,000 scale, contours at 10 metres V.I.					
Open, cultivated plains with scattered, rocky outcrops & boulders in the western half and rocky hills with scattered cultivation patches in eastern half	Plane-tabling	248·0	9·1	58·0	111·9	

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III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 21 Party.—	**Departmental Original Surveys—1:25,000 scale, contours at 10 metres V.I.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—Contd.**
Flat, scrub-covered hills and gently undulating plains	(*a*) By air-cum-ground method:—					
	Theodolite traverse and its computations	26·0 linear km	48·7 linear km	63·1 per linear km	92·9 per linear km	Supplementary control.
	Ground verification and contouring	370·0	22·7	61·9	88·4	
Partly intricate, rocky, scrub-covered hills and partly undulating plains with fairly dense vegetation	(*b*) By ground method:—					
	Subsidiary triangulation and its computations ..	310·0	216·3	9·0	17·5	
	Plane-tabling	499·0	11·8	128·5	176·0	
No. 24 Party.—	**Departmental Surveys—1:25,000 scale, contours at 10 metres V.I.**					
Scrub covered low hills and gently undulating plains	Air survey of planimetry ..	1,479·0	92·4	10·9	14·2	
	Narmada Commanded Area—2-inch scale, contours at 2 feet V.I.					
70% intricate, undulating ground with deep nālās and extensive broken ground and 30% open cultivated plains	Air survey and fair mapping ..	1,580·0	24·7	37·2	48·5	
	Traverse computations ..	64·0 linear km	128·1 linear km	3·2 per linear km	4·2 per linear km	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 24 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Contd.***
	Levelling computations ..	601·0 linear km	42·9 linear km	2·2 per linear km	2·8 per linear km	
	Bedti Project—4-inch and 1 : 10,000 scales, contours at 2·5 and 5 metres V.Is.					
Intricate, undulating low hills mostly covered by dense teak, rosewood, scattered bamboo and other trees interlaced with heavy undergrowth	Triangulation	404·0	303·0	11·5	19·3	
	Theodolite traverse	239·6 linear km	17·4 linear km	147·3 per linear km	231·8 per linear km	
	Single tertiary levelling ..	634·7 linear km	70·3 linear km	28·9 per linear km	45·0 per linear km	
	Subsidiary single tertiary levelling	277·2 linear km	76·3 linear km	12·7 per linear km	19·9 per linear km	
	Plane-tabling—4-inch scale ..	236·0	6·5	249·2	386·0	Original survey.
	Plane-tabling—1 : 10,000 scale ..	8·8	2·5	698·8	1,093·1	Original survey.

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 24 Party.—*Concld.*	**Hogenakal Project—2-inch and 1 : 25,000 scales, contours at 2·5 and 5 metres V.Is.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**SOUTHERN CIRCLE.—*Concld.***
70% open, undulating plains with scattered scrub and rocks and 30% heavily wooded, low hills with deep valleys	Theodolite traverse	45·4 linear km	36·8 linear km	168·3 per linear km	258·3 per linear km	
	Double tertiary levelling ..	771·0 linear km	78·9 linear km	22·7 per linear km	34·2 per linear km	
	Single tertiary levelling ..	579·0 linear km	68·7 linear km	26·5 per linear km	39·6 per linear km	
	Subsidiary single tertiary levelling	150·7 linear km	72·9 linear km	25·0 per linear km	37·0 per linear km	
	Post-pointing of trig. control, photo verification and supplementary height control on 2-inch scale air photographs ..	215·2	15·4	103·0	154·9	
	Plane-tabling on 1 : 25,000 scale, contours at 2·5 metres V.I. ..	14·2	6·2	282·2	412·5	Original survey.
	Plane-tabling on 1 : 25,000 scale, contours at 5 metres V.I. ..	32·1	8·7	205·8	294·8	Original survey.

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 4 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE**
	Departmental Surveys—½-inch scale					
Undulating area with low jungle clad hills	Verification of office copy corrections	2,800·0	1,499·9	0·6	0·9	
	Departmental Surveys—1 : 50,000 scale, contours at 20 metres V.I.					
	Air survey on 2-inch scale ..	2,149·0	100·4	12·6	16·4	
	Fair mapping	4,040·0	70·5	19·3	25·1	
	Computations	6,621·0	585·3	0·4	0·5	
	Mâhi Hydel and Irrigation Project (Reservoir Survey)—1 : 25,000 scale, contours at 2·5 metres V.I.					
Low hills covered with fairly dense jungle	Triangulation	181·0	70·2	65·2	87·3	
	Double tertiary levelling ..	417·0 linear km	54·7 linear km	24·0 per linear km	33·5 per linear km	
	Plane-tabling	223·0	12·5	94·7	128·2	Original survey.

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 4 Party.—*Contd.*	**Kotlibhel Hydel and Irrigation Project.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—*Contd.***
	1. Reservoir Survey—1 : 25,000 and 1 : 16,000 scales, contours at 10 feet V.I.					
High hills with deep gorges	Triangulation	499·0	51·4	53·9	74·7	
	Double tertiary levelling ..	375·0 linear km	53·2 linear km	32·2 per linear km	45·6 per linear km	
	Plane-tabling on 1 : 25,000 scale ..	13·5	5·2	441·9	604·4	Original survey.
	Plane-tabling on 1 : 16,000 scale ..	33·2	3·8	442·1	604·8	Original survey.
	Blue-print survey on 1 : 16,000 scale	44·0	3·6	443·1	606·2	
	2. Dam site Survey—1 : 4,000 scale, contours at 5 metres V.I.					
	Plane-tabling	2·8	0·4	437·9	598·9	Original survey.
	Kānpur Aerodrome					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
Industrial and built-up area	Triangulation	70·0	131·2	49·1	70·1	

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III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 4 Party.—*Contd.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—*Contd.***
	Theodolite traverse	8·0 linear km	96·6 linear km	37·6 per linear km	49·0 per linear km	
	Double tertiary levelling ..	23 0 lidear km	19·3 linear km	23·9 per linear km	31·1 per linear km	
	Plane-tabling	41·4	25·9	29·5	40·3	Original survey.
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
	Verification survey on ½-inch scale	2,072·0	828·8	1·0	1·4	
	Panna Aerodrome					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
Built-up areas and thick forest	Triangulation	143·0	50·1	10·3	14·8	
	Theodolite traverse	20·0 linear km	48·3 linear km	18·0 per linear km	23·4 per linear km	
	Double tertiary levelling ..	47·0 linear km	44·3 linear km	11·7 per linear km	15·2 per linear km	
	Plane-tabling	41·4	25·4	22·5	29·6	Original survey.

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C. —Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 4 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—*Contd.***
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
	Verification survey on ¼-inch scale	1,989·0	727·7	1·5	2·0	
	Satna Aerodrome					
	1. Landing Chart—1 : 50,000 scale, contours at 20 metres V.I.					
Industrial and built-up areas	Triangulation	142·0	387·3	9·5	13·3	
	Theodolite traverse	4·0 linear km	38·6 linear km	39·8 per linear km	51·8 per linear km	
	Double tertiary levelling ..	11·0 linear km	19·3 linear km	28·6 per linear km	37·2 per linear km	
	Plane-tabling	41·4	40·1	39·1	54·7	Original survey.
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
	Verification survey on ¼-inch scale	1,968·0	1,256·2	1·1	1·5	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 6 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. pre sq. km	**WESTERN CIRCLE.—** ***Contd.***
	Departmental Surveys—1 : 50,000 scale, contours at 20 metres V.I.					
40% open cultivated plains and the rest thickly wooded undulating ground and hills	Air survey of planimetry on 2-inch scale	1,437·0	228·1	2·4	3·2	Original survey.
Flat mud, partly dry and partly wet with low islands	Air survey from photographs verified and contoured on the ground on 2-inch scale ..	6,673·0	341·6	1·6	2·1	Original survey.
40% open cultivated plains and the rest thickly wooded undulating ground and hills	Ground verification and contouring	1,437·0	82·3	19·5	27·8	
Flat mud, partly dry and partly wet with low islands	Fair mapping	6,337·0	226·6	3·1	4·0	
Open undulating country	Verification survey for office copy corrections on 1-inch scale ..	2,844·0	3,160·0	0·4	0·6	
	Deesa and Porbander Aerodromes					
	1. Landing Charts—1 : 50,000 scale, contours at 20 metres V.I.					
Partly open plain and partly undulating country	Plane-tabling	83·0	63·8	24·1	33·8	Revision survey.
	2. Approach Charts—1 : 250,000 scale, contours at 100 metres V.I.					
Partly open plain with hills and partly undulating country with sand dunes and hillocks	Verification survey	3,212·0	1,047·4	1·0	1·4	

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III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 13 Party.—	**Bhākra Project—4-inch scale, contours at 1 foot V.I.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—** ***Contd.***
Sandy area, interspersed with rocky hillocks—southern part slightly undulating with incidence of narrow streams and ravines—largely cultivated and fairly densely inhabited in Gurgaon and Mahendragarh Districts; flat plain, very largely cultivated and densely inhabited in Hoshiārpur, Jullundur and Kapūrthala Districts of the Punjab	Double tertiary levelling and computations	539·7 linear km	102·5 linear km	16·2 per linear km	24·7 per linear km	
	Single tertiary levelling and computations	6,648·2 linear km	209·9 linear km	8·7 per linear km	12·2 per linear km	
	Rapid verification on 1-inch and 1 : 50,000 scales	1,761·2	852·2	1·0	1·3	
	Compilation and rapid fair mapping	3,447·3	17·7	25·3	31·5	
	Pang Reservoir—1 : 25,000 scale, contours at 2·5 and 10 metres V.Is.					
Moderately undulating with a large number of streams locally known as "Khads", largely cultivated in the Kāngra District of the Punjab	Supplementary triangulation and computations	337·0	224·5	11·3	15·7	
	Double tertiary levelling and computations	285·0 linear km	52·4 linear km	41·2 per linear km	57·5 per linear km	
	Single tertiary levelling, post-pointing and computations ..	1,775·0 linear km	98·6 linear km	14·6 per linear km	20·2 per linear km	
	Photo verification	323·8	54·3	18·9	26·3	

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III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 13 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—*Contd.***
	Ground verification and contouring on blue-prints	113·4	26·2	57·7	80·1	
	Original air survey of planimetry	440·0	90·4	9·1	11·6	
	Pāndoh Reservoir—1 : 25,000 scale, contours at 5 metres V.I.					
Rocky with steep hills covered by dense jungle on both sides of Beās River, very thinly inhabited with little cultivation in Mandi District of Himāchal Pradesh	Supplementary triangulation and computations	31·1	25·8	90·0	133·9	
	Double tertiary levelling, post-pointing and computations ..	24·1 linear km	40·2 linear km	40·2 per linear km	60·2 per linear km	
	Plane-tabling	4·7	1·6	828·5	1,196·2	Original survey.
	Departmental Surveys—1-inch scale (for reissue)					
	Verification of office copy corrections	1,108·5	1,146·7	1·5	2·0	
	Survey of metre contours ..	64·8	88·4	11·7	16·5	

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III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 31 Party.—	**Reclamation of the Little Rann of Kutch—4-inch scale, contours at 2 feet and 10 feet V.Is.**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—** ***Contd.***
Flat, featureless, barren salt waste, mostly dry in the east and wet in the west, with poor communications and no habitation except the bits which are elevated and have thorny shrubs	Computations (of levelling) ..	2,260·0 linear km	240·0 linear km	4·6 per linear km	5·9 per linear km	
	Fair mapping	3,048·0	209·3	9·7	12·6	
	Forest Surveys—4-inch scale, contours at 25 feet V.I.					
Low-lying plains surrounding the eastern, southern and western peripheries of the Little Rann of Kutch	Fair mapping	168·0	17·1	54·4	70·7	
	Bhima Lift Irrigation Project—1 : 15,000 scale, contours at 2·5 metres V.I.					
Cultivated plains with sparse vegetation, numerous bunds and rocky sub-soil on the northern flanks of Bhima River	Triangulation and post-pointing ..	1,120·0	206·1	12·9	17·1	
	Double tertiary levelling ..	577·0 linear km	55·3 linear km	25·1 per linear km	33·0 per linear km	
	Single tertiary levelling ..	1,652·0 linear km	100·5 linear km	16·4 per linear km	21·6 per linear km	
	Photo verification on 2-inch scale	453·0	119·2	19·6	25·8	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 31 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE—*Contd.***
	Computations (of levelling) ..	2,049·0 linear km	275·7 linear km	1·3 per linear km	1·7 per linear km	
	Morna Project					
Intricate undulations with a little cultivation	Double tertiary levelling ..	83·0 linear km	28·2 linear km	54·7 per linear km	72·9 per linear km	Height control only.
	Gyānganga Project					
Cultivated plains terminating in a small area of hilly terrain	Double tertiary levelling ..	98·0 linear km	41·9 linear km	54·3 per linear km	72·5 per linear km	Height control only.
No. 32 Party.—						
	Departmental Surveys—1 : 25,000 scale, contours at 10 metres V.I.					
Open forest	Triangulation (in Damān area) ..	1,813·0	481·3	4·4	6·0	
Plains with marsh and salt waste	Triangulation (in Diu area) ..	134·7	168·4	11·5	15·9	
	Departmental Surveys—1-inch scale					
Densely populated plains	Verification of office copy corrections	2,447·0	638·5	1·4	1·9	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 32 Party.—*Contd.*	**Akola Aerodrome**	sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—*Contd.***
	1. Landing Chart—1:50,000 scale, contours at 20 metres and 50 feet V.Is.					
Open cultivated plains	Triangulation	64·8	48·7	50·2	69·0	
Open ground	Single tertiary levelling ..	11·3 linear km	113·0 linear km	4·0 per linear km	5·1 per linear km	
Flat plains	Plane-tabling	54·4	42·0	15·0	23·1	Original survey.
	2. Approach Chart—1 : 250,000 scale, contours at 100 metres V.I.					
Flat plains	Verification survey on ¼-inch scale	2,030·6	858·1	0·7	1·0	
	Bombay Guide Map—1 : 25,000 scale, contours at 10 metres V.I.					
Built-up area	Plane-tabling	220·1	39·5	27·8	38·1	Revision survey.
	Narmada Commanded Area Project—4-inch scale, contours at 2 feet V.I.					
Open cultivated plains	Double tertiary levelling ..	726·8 linear km	77·3 linear km	40·5 per linear km	54·0 per linear km	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 32 Party.—*Concld.*		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	**WESTERN CIRCLE.—*Concld.***
	Single tertiary levelling ..	7,291·6 linear km	164·6 linear km	9·3 per linear km	12·4 per linear km	
	Photo verification	1,856·8	188·2	9·0	11·6	
	Indrāvati Project—4-inch scale, contours at 5 feet V.I.					
Open undulating ground	Double tertiary levelling ..	462·4 linear km	61·4 linear km	42·0 per linear km	57·4 per linear km	
	Single tertiary levelling ..	1,717·0 linear km	111·0 linear km	11·8 per linear km	16·1 per linear km	
	Photo verification	628·6	94·8	12·6	17·2	
	Theodolite traverse	26·6 linear km	133·0 linear km	9·7 per linear km	13·2 per linear km	
	Compass traverse	55·4 linear km	10·7 linear km	118·6 per linear km	162·2 per linear km	

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† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

III. TABLE C.—Areas, out-turns and cost rates of Surveys, Computations and Mapping

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per man per month	Cost rate		Remarks
				*Net	†Overall	
No. 15 Party.—		sq. km	sq. km	Rs. per sq. km	Rs. per sq. km	TRAINING DIRECTORATE
	Training Areas around Hyderābād—1 : 4,000 scale, contours at 2 metres V.I.					
Undulating plains interspersed with low hills covered with rock outcrops	Triangulation	6·7	5·6	586·2	877·3	
	Training Areas around Hyderābād—1 : 25,000 scale, contours at 10 metres V.I.					
Undulating plains interspersed with low hills covered with rock outcrops	Triangulation	137·3	82·4	41·1	62·0	
	Training Areas around Hyderābād—1 : 50,000 scale, contours at 20 metres V.I.					
Undulating plains interspersed with low hills covered with rock outcrops	Triangulation	518·0	777·0	8·7	13·1	
No. 16 Party.—						
	Mussoorie Guide Map—1 : 10,000 scale, contours at 20 meters V.I.					
Hilly, covered with fairly dense jungle and having Mussoorie Town	Blue-print revision survey ..	53·0	1·1	347·0	451·0	

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IV. SURVEY REPORTS, NORTHERN DIRECTORATE

DIRECTOR :—COLONEL S. K. S. Mudaliar, B.A., M.I.S., M.I.E., M.R.S.H.

DEPUTY DIRECTOR, HEADQUARTERS :— LT.-COLONEL M. L. Chopra, B.SC., B.E., A.M.I.E., Engineers.

DEPUTY DIRECTOR, TECHNICAL :—
- LT.-COLONEL Y. Ramachandran, B.SC. (Mining), A.M.I.E., from 9-4-62 to 15-12-62 and again from 16-1-63.
- LT.-COLONEL M. L. Chopra, B.SC., B.E., A.M.I.E., Engineers, from 16-12-62 to 15-1-63 (in addition to his duties as Deputy Director, Headquarters).

DEPUTY DIRECTOR, PHOTOGRAMMETRY :— LT.-COLONEL M. M. Datta, B.SC. (Hons.), B.E., M.SC., PH.E. (I.T.C.), M.I.S., M.I.E., Engineers.

DEPUTY DIRECTOR, WESTERN SECTOR :— LT.-COLONEL Y. L. Khular, B.SC. (Engg.), A.M.I.E., Engineers.

DEPUTY DIRECTOR, CENTRAL SECTOR :— LT.-COLONEL S. Choudhuri, A.M.I.E., Engineers.

DEPUTY DIRECTOR, EASTERN SECTOR:— LT.-COLONEL N. K. Sen, B.SC. (Hons.), M.I.S., A.M.I.E., Engineers.

35. **Areas Surveyed.**—

176·1 square kilometres of triangulation for the survey of submergence area along Karnaphuli River and its tributaries.

84·8 linear kilometres of initial theodolite traverse for boundary demarcation.

139·0 linear kilometres of theodolite traverse for the survey of submergence area along Karnaphuli River and its tributaries.

15·0 square kilometres of 4-inch original ground survey.

26·9 square kilometres of photo verification and height control for 4-inch survey.

15·8 square kilometres of verification survey along the course of Fenny River.

5·1 linear kilometres of final traverse, boundary demarcation and original survey on 4-inch scale astride the international boundary of Rājasthān-West Pākistān.

1,036·7 linear kilometres of boundary verification and handing over to State Government officials.

551·2 linear kilometres of boundary verification and reconnaissance for missing pillars.

205·7 square kilometres of air survey of planimetry by graphical method on 4-inch scale astride Indo-Pākistān boundary.

19·5 square kilometres of air survey of planimetry by graphical method on 4-inch scale for determining the submergence area due to commissioning of a dam on Karnaphuli River.

No. 27 PARTY

Officer in charge :— Major T. S. Bedi, B.SC., A.M.I.E., Engineers, to 3-8-62 and again from 19-8-62.
Major B. B. S. Karki, B.SC., A.M.I.E., Engineers, from 4-8-62 to 18-8-62.

36. **General.**—This unit in conjunction with No. 7 Party of Survey of Pākistān was engaged on demarcation of India-West Pākistān Boundary between Rājasthān (India)-West Pākistān and Punjab (India)-West Pākistān under the control of Deputy Director (Tech.).

The party headquarters was at Mussoorie (U.P.) during the recess and Amritsar (Punjab) during the field.

37. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers, 2 Surveyors, 1 Scientific Assistant, 1 Geodetic Computer, 1 Survey Assistant and 26 other Class III personnel including 5 Clerks, 1 Recordkeeper, 1 Storekeeper and 4 M.T. Drivers.

38. **Areas Surveyed.**—

5·1 linear kilometres of final theodolite traverse, boundary demarcation and original ground survey on 4-inch scale astride the international boundary of Rājasthān–West Pākistān.

1,036·7 linear kilometres of boundary verification and hanping over to State Government officials.

551·2 linear kilometres of boundary verification and reconnaissance for missing pillars.

39. **Recess Work.**—Fair mapping of 27 boundary sheets and examination of 51 preliminary proofs (27 of India and 24 of Pākistān) and 124 final proofs (65 of India and 59 of Pākistān) was carried out under Shri H. K. Chopra (Class II) assisted by Sarva Shri R. S. Chhabra, P. N. Puri, Surveyors with 12 other Class III personnel.

Checking of field computations and arrangement of field records and computations were done under Shri P. C. Dutt, Survey Assistant with 2 computers.

40. **Field Work.**—Field work was organized and carried out jointly with the personnel of Survey of Pākistān as follows :—

(*a*) *Theodolite traverse, demarcation and handing over of boundary pillars to State Government officials of Rājasthān and West Pākistān.*—(*i*) *Camp South* (*Jodhpur*).—Shri N. N. Joshi (Class II) assisted by Shri H. G. Dhingra, Geodetic Computer with 6 other Class III personnel, carried out theodolite traverse, demarcation and verification in Barmer District and handing over of boundary pillars to the Rājasthān and West Pākistān State Government Officials in the Districts of Barmer and Jaisalmer (India) and Khairpur, Rahimyar Khan, Thārpārkar and Sukkur (West Pākistān).

(*ii*) *Camp North* (*Bikaner*).—Shri M. L. Johar, Scientific Assistant with 4 other Class III personnel, carried out theodolite traverse, demarcation, verification and handing over of boundary pillars to the Rājasthān and West Pākistān, State Government Officials in the districts of Bikaner, Gangānagar and Jaisalmer (Rājasthān) and Bahāwalnagar and Bahāwalpur (West Pākistān).

(*iii*) *Punjab Camp* (*Ferozepur*).—Shri R. S. Chhabra, Surveyor with 5 other Class III personnel, carried out reconnaissance of entire boundary along Punjab (India)-West Pākistān with a view to ascertain the number of missing pillars requiring reconstruction on new design of riverine pillars and handing over of those pillars which could not be located during the field operations of 1960–61, due to being submerged in flood waters at that time.

The Punjab camp was re-organized into 2 camps at Gurdāspur and Ferozepur under Sarva Shri M. L. Johar, Scientific Assistant and H. G. Dhingra, Geodetic Computer respectively with 3 demarcators each for relaying positions of boundary pillars where new type of riverine pillars were to be constructed.

(*b*) *Headquarters Computing and Records Section.*—A Computing and Records Section was established at the Party headquarters under 1 Computer under the direct control of Officer-in-Charge of the party.

41. **Technical Methods.**—(*a*) *Rājasthān.*—The old State boundary pillars were in existence. The same positions were accepted after verification and new pillars were constructed in their places by Public Works Department. For checking of old pillars and location of new pillars, revenue records and Survey of India maps were used.

(*b*) *Final Traverse.*—Final traverse was run to connect up the pillars. The co-ordinates thus obtained were plotted on Survey of India maps to have a direct check on the accuracy of pillar positions.

(*c*) *Joint boundary verification and handing over of boundary pillars.*—The boundary was verified by measurements of angles and distances. Wild T2 theodolite was used for the purpose. Missing

pillars were relayed and rebuilt. The boundary pillars were handed over to State Government Officials of Rājasthān (India) and West Pākistān.

(*d*) *Relaying of missing pillars along the Punjab (India)-West Pākistān Boundary.*—Pillars found missing due to floods and river action were relayed with the help of Wild T2 theodolite by observation of angles and measurement of distances from the pillar found intanct on the ground.

42. **Description of Country.**—The area in Rājasthān is mainly an undeveloped desert with numerous sand dunes. Absence of water sources near the area of work at certain places caused considerable hardship to field personnel. At places snakes were a menace.

The area in Punjab is plain and fairly well inhabited.

43. **Miscellaneous.**—*Health.*—Health of the field personnel remained satisfactory. Medical units were attached to camps to look after the health of personnel in Rājasthān.

Communications.—The mode of conveyance was by tractors and camels, jeeps and other 4-wheel drive vehicles were also found helpful. Intercommunication between Officer-in-Charge of the party, Camp Officers and the individual field hands was by wireless. Police radiograms were also used for the purpose. Each demarcator was provided with a Wireless Transmission set.

Supply of water.—Tractors fitted with tanks were found useful for supplying water to detachments in the areas where water was not available locally. Camels were also used for supply of water at certain places where tractors could not operate.

PHOTOGRAMMETRIC GROUP (N.D.)

DEPUTY DIRECTOR:—{ LT.-COLONEL M. M. Datta, B.SC. (Hons.), B.E., M.SC. PH.E. (I.T.C.), M.I.S., M.I.E., Engineers.

44. **Summary.**—The Photogrammetric Group of the Northern Directorate was formed with effect from 6-3-62 with headquarters at Dehra Dūn (U.P.).

45. **Areas Surveyed.**—No departmental survey was carried out during the period but fair mapping for 4-inch Sone High Level Canal Project, 3-inch Delhi Regional Plan Survey, 6-inch Delhi Regional Plan Survey and 1 : 8,000 Nāgārjunakonda Excavated Sites was carried out.

46. **Equipment.**—The following further photogrammetric equipment was received :—

Zeiss Reductor Ratio Printer	..	.. 1
I.T.C.—Jerie Analogue Computers	..	,, 2

The former equipment is being used for preparing compensated positive prints from Eagle IX aerial photography duly corrected for lens distortions. The latter equipment is being used for block adjustment of aerial triangulation in areas of sparse control.

No. 20 (PHOTOGRAMMETRIC) PARTY

Officer in charge :—
- Lt.-Colonel M. M. Datta, B.Sc. (Hons.), B.E. (Civil)' M.Sc. Ph.E. (I.T.C.), M.I.S., M.I.E., Engineers, to 18-4-62 (in addition to his duties as Deputy Director, Photogrammetry).
- Major S. M. Chadha, A.M.I.E., Engineers, from 19-4-62 to 11-1-63.
- Major B. Sarin, B.Sc., Ph.E. (I.T.C.), Engineers, from 12-1-63.

47. **General.**—The party was engaged mainly on the training of officers and operators on the photogrammetric instruments. A certain amount of productive work was also carried out.

Training in aerial photo-interpretation for forestry was also imparted to a batch of 8 Forest Officers from different states of the Indian Union.

The headquarters of the unit remained at Dehra Dūn (U.P.) throughout the period under report.

48. **Personnel.**—The average strength of the party was 2 Class I Officers, 2 Class II Officers, 1 Survey Assistant, 1 Surveyor, and 35 other Class III personnel including 4 Clerks, 1 Store keeper and 1 Recordkeeper.

49. **Recess Work.**—During recess the party was organized as follows :—

(*a*) *Training.*—A regular course of training in air survey and in the operation of photogrammetric instruments was conducted by Shri Ratna Singh (Class II) assisted by Shri D. D. Mehta, Surveyor with 2 Topo Trainees Type 'A'. One Class II Officer with 3 Topo Trainees Type 'A' completed their training in theory and practice of photogrammetric survey. 8 Plane-tablers/Air Survey Draftsmen were given training in the operation of Stereotopes. 29 Topo Trainees Type 'A' continued their training in theory and practice of photogrammetric survey. 31 Topo Trainees Type 'B' continued their training in Arundel Method of air survey and in the operation of Stereotopes.

Training in aerial photo-interpretation for forestry for pre-investment survey of forest resources was imparted to a batch of 8 Forest Officers from different states of the Indian Union.

(*b*) *Fair mapping.*—One section under Shri Jai Prakash, Survey Assistant carried out 259·0 square kilometres of fair mapping of the Sone Valley area, falling in Sheets 63 O, 63 P, 72 C and 72 D for 4-inch Sone High Level Canal Project Survey, 362·6 square kilometres of fair mapping for 3-inch Delhi Regional Plan

Survey and 145·0 square kilometres of fair mapping for 6-inch Delhi Regional Plan Survey falling in Sheets 53 D and 53 H.

50. **Field Work.**—Field training in triangulation and theodolite traverse was given to 4 Surveyors in the Mussoorie Hills.

51. **Miscellaneous.**—The health of the personnel remained good.

No. 22 (PHOTOGRAMMETRIC) PARTY

Officer in charge :—
- LT.-COLONEL M. M. Datta, B.SC. (Hons.), B.E. (Civil), M.I.S. M.I.E., M.SC. PH.E. (I.T.C.), Engineers, to 9–4–62 [in addition to his duties as Deputy Director (Photo)].
- Major N .B. Nayar, B.SC. (Engg.), A.M.I.E., Engineers, from 10–4–62 to 5–10–62 and again from 12–11–62 to 3–1–63.
- Shri V. Krishnamurthy, M.A., A.R.I.C.S., from 6–10–62 to 11–11–62.
- Major S. M. Chadha, A.M.I.E., Engineers, from 4–1–63 to 24–3–63.
- Major G. C. Agarwal, B.E. (Hons.) Civil, A.M.I.E., M.SC. PH.E. (I.T.C.), Engineers, from 25–3–63.

52. **General.**—The party carried out examination and corrections of Delhi Regional Plan Survey sheets on 6-inch and 1 : 6,000 scales.

The headquarters of the unit remained at Dehra Dūn (U.P.) throughout the period under report.

53. **Recess Work.**—The party was organized into one drawing section under Shri Ishar Singh, Surveyor and two air survey sections under Shri A. K. Bhatia (Class I), assisted by Shri Resham Singh, Surveyor and Shri B. L. Sharma, Survey Assistant. The drawing section was later on taken over by Shri M. R. Subramanian (Class II).

The drawing section completed the fair mapping of the remainder of 6-inch Delhi Regional Plan Survey sheets.

54. **Miscellaneous.**—The health of the personnel remained good.

No. 26 (PHOTOGRAMMETRIC) PARTY

Officer in charge :—
- Shri U. D. Mamgain, B.SC., A.M.I.S., C.H., to 5–4–62.
- Shri V. Krishnamurty, M.A., A.R.I.C.S., from 6–4–62.

55. **General.**—Extra-departmental surveys of the Nāgārjunakonda excavated sites were carried out for the Archaeological Survey of India.

The headquarters of the unit remained at Dehra Dūn (U.P.) throughout the period under report.

56. **Recess Work.**—The party was organized into two air survey sections under Shri A. N. Gossain (Class II) and Shri D. N. Sharma (Class II). These sections completed, besides other

tasks, the fair mapping of one sheet of the Nāgārjunakonda Project on 1 : 8,000 scale and examination and corrections of one sheet of the Delhi Regional Plan Survey on 1 : 10,000 scale.

No. 30 (PHOTOGRAMMETRIC) PARTY

Officer in charge :—{Shri N. Gopalan, M.A., to 31-12-62 and again from 4-2-63. Major P. Misra, B.SC., B.E., M.R.S.H., F.R.G.S., Engineers, from 1-1-63 to 3-2-63.

57. **General.**—Training in aerial photo-interpretation for Urban Area Analysis was imparted to three Officers of the Calcutta Metropolitan Planning Organization, Government of West Bengal.

The headquarters of the party remained at Calcutta (West Bengal) throughout the period under report.

EASTERN SECTOR (N.D.)

DEPUTY DIRECTOR:—LT.-COLONEL N. K. Sen, B.SC. (Hons.), M.I.S., A.M.I.E., Engineers.

58. **Summary.**—The Eastern Sector was raised with effect from 5th March 1962.

59. **Areas Surveyed.**—

205·7 square kilometres of air survey on 4-inch scale astride the Indo-Pākistān boundary.

19·5 square kilometres of air survey on 4-inch scale for determining the submergence area due to commissioning of a dam on Karnaphuli River.

No. 12 PARTY

Officer in charge :—{Shri T. K. Guruswamy, M.A., to 24-7-62. Major A. S. Iyer, B.E. (Civil), A.M.I.E., Engineers, from 25-7-62.

60. **General.**—This unit carried out the following tasks connected with the boundary demarcation and allied surveys along India and East Pākistān Border.

(*i*) Surveys for determining the submergence area in India due to the commissioning of a dam on Karnaphuli River in East Pākistān.

(*ii*) Air survey in connection with the demarcation of Indo-Pākistān Boundary between Assam-East Pākistān.

For some period the unit also carried out fair mapping of departmental sheets in 79 B. These sheets which were under fair mapping had to be shelved due to other high priority work and were transferred to Eastern Circle for completion.

The headquarters of the party remained at Shillong (Assam) throughout the period under report.

61. **Personnel.**—The average strength of the unit was 3 Class I Officers, 3 Class II Officers, 7 Class III Division I Officers and 41 other Class III personnel including Clerks, Storekeeper and M.T. Drivers.

62. **Areas Surveyed.**—

205·7 square kilometres of air survey on 4-inch scale astride the Indo-Pākistān boundary.

19·5 square kilometres of air survey on 4-inch scale for determining the submergence area due to commissioning of a dam on Karnaphuli River.

63. **Recess Work.**—Shri K. P. Gupta Choudhury, Survey Assistant later replaced by Shri T. M. G. Nambisan (Class II) with 10 Class III personnel, completed 205·7 square kilometres of 4-inch air survey up to a width of one mile on either side of the Indo-Pākistān Boundary in 5 sheets in the Mizo-Chittagong Hill Tracts Sector. This work was carried out at Shillong under the immediate supervision of Officer-in-Charge, No. 12 Party, Survey of India. The Pākistān team was to complete similarly air survey of 5 other sheets of this area at Dacca under the supervision of Officer-in-Charge No. 6 Party, Survey of Pākistān. This work was later transferred to No. 35 Party.

This section also completed 19·5 square kilometres of air survey and fair mapping in sheets 84 A and B for determining the area of submergence in India due to commissioning of Kaptai Dam in the Karnaphuli River in East Pākistān. This work was done unilaterally by Survey of India. Later, however, the area of this submergence was determined jointly with the personnel of Survey of Pākistān as described in No. 35 Party's report.

64. **Field Work.**—The field work was organized and carried out as follows :—

Karnaphuli submergence surveys.—Due to the construction of a dam on Karnaphuli River by the Government of Pākistān some areas adjoining the Indo-Pākistān were expected to be submerged on the Indian side. To assess this area of submergence on commissioning of the Dam it was decided to survey this area on 4-inch scale jointly with the personnel of Survey of Pākistān. Shri M. C. Gogia (Class I) with 10 Class III personnel started the field work jointly with an equal number of technical personnel of the Survey of Pākistān. This work was subsequently transferred to the administrative and technical control of No. 35 Party.

65. **Technical Methods.**—Air survey of 5 India-Pākistān boundary sheets in Mizo Hills District–Chittagong Hill Tracts Sector up to a depth of 1 mile on either side of the boundary was carried out, by personnel of Survey of India under direct supervision of Officer-in-Charge, No. 12 Party, at Shillong. Contouring was carried out on air photographs at 10 feet V.I. up to 130 feet and 25 feet V.I. between 130 feet and 150 feet. Air survey of 5

other sheets of the aforesaid area was completed similarly at Dacca by personnel of Survey of Pākistān under direct supervision of Officer-in-Charge, No. 6 Party, Survey of Pākistān. Facsimilies of the air survey sections prepared by Survey of India and Survey of Pākistān were to be exchanged for examination and the sheets were to be published after incorporation of corrections, if any.

66. **Description of Country.**—The area in Mizo Hills District-Chittagong Hill Tracts Sector comprises of low intricate hills covered with dense jungle mainly bamboo. Boats and rafts are the only means of communication in the area when there is water in the streams. At other times when the streams are dry, communication is by rugged paths following river banks and in some areas through the bed of the streams. Camping facilities are very meagre and the necessities of life are scarce.

CENTRAL SECTOR (N.D.)

DEPUTY DIRECTOR :—Lt.-Colonel S. Choudhuri, A.M.I.S., Engineers.

67. **Summary.**—The Central Sector was formed with effect from 14th March 1962 with headquarters at Dehra Dūn (U.P.). No. 35 Party, which was raised on 1st December 1962 in the Eastern Sector, was transferred to this Sector with effect from 15th January 1963.

68. **Areas Surveyed.**—

84·8 linear kilometres of initial theodolite traverse for boundary demarcation.

176·1 square kilometres of triangulation for the survey of submergence area along Karnaphuli River and its tributaries.

139·0 linear kilometers of theodolite traverse for the survey of submergence area along Karnaphuli River and its tributaries.

15·0 square kilometers of 4-inch original ground survey for the survey of submergence area along Karnaphuli River and its tributaries.

26·9 square kilometres of photo verification and height control for 4-inch survey for the Karnaphuli submergence area on India-Pākistān (Assam-East Pākistān) Boundary sheets (1960–62 surveys).

15·8 square kilometres of verification survey along the course of Fenny River.

No. 35 PARTY

Officer in charge :—Major D. M. Gupta, B.Sc., B.E. (Hons.), A.M.I.E., Engineers.

69. **General.**—The party was raised on 1st December 1962, with a view to take over all work connected with the boundary demarcation and allied surveys along India and East Pākistān Border.

The work of demarcation of the boundary between Tripura (India) and East Pākistān which was so far being carried out by the Director, Land Records and Surveys, West Bengal, was taken over by this unit immediately on its being raised. The field work commenced from January 1963.

The field work of survey for calculating the submergence area in Indian territory along Karnaphuli River and its tributaries in Mizo District of Assam which was so far being done under No. 12 Party was also taken over during February 1963.

The headquarters of the unit remained at Agartala (Tripura) throughout the period under report.

70. **Personnel.**—The average strength of the party was 2 Class I Officers, 3 Class II Officers, 7 Class III Division I Officers and 22 other Class III personnel including Clerks and M.T. Drivers.

71. **Areas Surveyed.**—

84·8 linear kilometres of initial theodolite traverse for boundary demarcation.

176·1 square kilometres of triangulation for the survey of submergence area along Karnaphuli River and its tributaries.

139·0 linear kilometres of theodolite traverse for the survey of submergence area along Karnaphuli River and its tributaries.

15·0 square kilometres of 4-inch original ground survey for the survey of submergence area along Karnaphuli River and its tributaries.

26·9 square kilometres of photo verification and height control for 4-inch survey for the Karnaphuli Submergence Area on India-Pākistān (Assam-East Pākistān) Boundary sheets (1960–62 surveys).

15·8 square kilometres of verification survey along the course of Feny River.

72. **Field Work.**—The field work was organized as follows :—

Camp I.—Shri P. N. Puri, Surveyor with 6 Class III personnel completed 84·8 linear kilometres of initial theodolite traverse, jointly with the personnel of the Director of Land Records and

Surveys, East Pākistān for the demarcation of the International Boundary between Tripura (India) and East Pākistān. Theodolite traverse emanated from and closed on G.T. stations.

Camp II.—Shri H. K. Chopra (Class II) with 4 Class III personnel carried out the studies of the joint work already done by the Directors of Land Records and Surveys of East Pākistān and West Bengal (India), in connection with the demarcation of the boundary between Tripura (India) and the districts of Comilla and Noākhāli of East Pākistān. All the personnel of this camp remained in readiness to commence joint work with the personnel from East Pākistān as soon as joint agreement with the Director of Land Records and Surveys, East Pākistān was arrived at.

Camp III.—Shri B. R. Bose (Class II) with 3 Plane-tablers conducted the studies connected with the demarcation of the International Boundary between Tripura (India) and the districts of Chittagong and Chittagong Hill Tracts of East Pākistān, with a view to commence joint work of boundary demarcation in this subsector along with the personnel of the Director of Land Records and Surveys, East Pākistān, soon after the joint decision regarding the basis of demarcation was taken. This camp also completed 15·8 square kilometres of verification survey on grey prints of the existing 1-inch maps of the course of Fenny River over a length of about 80 kilometres as part of investigations carried out in connection with Tripura-East Pākistān boundary demarcation.

Demagiri Camp.—Shri M. C. Gogia (Class I) with 10 Class III personnel completed the following in Mizo Hills District jointly with the personnel of No. 6 Party, Survey of Pākistān, for determining the submergence area in Indian territory along Karnaphuli River and its tributaries due to the commissioning of Kaptai Dam in East Pākistān:—

176·1 square kilometres of triangulation.

139·0 linear kilometres of theodolite traverse.

15·0 square kilometres of 4-inch original ground survey with contour intervals of 10 feet up to 130 feet contour and 20 feet between 130 feet and 150 feet contours.

26·9 square kilometres of photo verification and height control for 4-inch survey of Karnaphuli Submergence Area on India-Pākistān (Assam-East Pākistān) boundary sheets (1960–62 surveys).

Computing Section.—Shri S. S. Chabbra (Class II) with 3 Computers was employed at Agartala for sorting out and checking of computations of the work previously carried out by the Directors of Land Records and Surveys, West Bengal and East Pākistān in Tripura-Comilla/Noākhāli sub-sector.

73. **Technical Methods.**—(*a*) *Boundary Surveys between Tripura (India) and East Pākistān.*—To achieve the necessary

accuracy of the theodolite traverse done for the International Boundary between India and Pākistān, glass-arc theodolites reading upto 1 second and standardized crinoline chains were used for angular and linear measurements respectively.

(*b*) *Karnaphuli Submergence Area.*—Normal departmental methods for large scale surveys were adopted.

74. **Description of Country.**—The area near the boundary between Tripura (India) and the districts of Sylhet, Comilla, Noākhāli and Chittagong of East Pākistān is mostly undulating with dense vegetation on the low hills and cultivated fields in the valleys. The flat alluvial plain of East Pākistān starts approximately from the boundary.

The area through which the International Boundary between Tripura and the district of Chittagong Hill Tracts of East Pākistān passes is hilly, covered with virgin thick forest and infested with wild animals such as elephants and tigers. Availability of rations and local porters is difficult. Transportation of stores and rations has to be done by porters.

The area along Karnaphuli River and its tributaries is mostly hilly covered with dense mixed jungle. *Jhum* cultivation is done at places. Communications between the villages are by pack tracks only. Villages are sparse. Food stuffs and other essential provisions have to be arranged from the main towns of Lungleh, Aijal and Silchar ; Lungleh being the nearest about 42 miles from Demagiri.

75. **Miscellaneous.**—Suitable season for field work is between the middle of October to the end of March, as the rains commence in the area during April and continue till late September making the land marshy and difficult to negotiate. Also, in areas where porters are the only mode of conveyance, their availability becomes all the more difficult in the months of April, May, September and October due to *jhum* cultivation.

V. SURVEY REPORTS, EASTERN CIRCLE

DIRECTOR :—COLONEL J. S. Paintal, M.I.S., M.I.E.

DEPUTY DIRECTOR :— Shri J. C. Sikka, B.A., A.M.I.S., to 9-11-62 and again from 1-1-63.
COLONEL J. S. Paintal, M.I.S., M.I.E., from 10-11-62 to 31-12-62 (additional charge).

76. Areas Surveyed.—

401·3 square kilometres of supplementary triangulation.

1,421·2 linear kilometres of theodolite traverse.

1,569·1 linear kilometres of double tertiary levelling.

2,750·6 linear kilometres of single tertiary levelling.

777·0 square kilometres of ground verification and height control on 2-inch scale.

169·9 square kilometres of 1 : 50,000 blue-print revision survey.

137·5 square kilometres of ground verification and contouring on 1 : 12,500 scale.

7,681·9 square kilometres of ¼-inch verification survey.

1,143·2 square kilometres of photo verification.

28·7 square kilometres ground verification and height control on 1 : 10,000 scale.

171·4 square kilometres of photo verification and height control.

4,002·0 square kilometres of spot-heighting of air photomosaics on 4-inch scale.

8·5 hectares of rectangulation for grid layout of Patratu Thermal Power Station.

No. 7 PARTY

Officer in charge :—Shri V. B. Mudkavi, M.Sc.

77. General.—The party was mainly employed on the following irrigation and development surveys falling in the states of Bihār, Manipur and West Bengal in addition to carrying out the fair mapping of departmental sheets :—

(*a*) Manipur Valley Development Project.
(*b*) Kosi Irrigation Project.
(*c*) Sasangada Iron Ore Deposits Project.
(*d*) Ramman River Project.
(*e*) Rinchingtong River Project.

The party was transferred from the administrative control of the Director, Western Circle to that of the Director, Eastern Circle with effect from 16th October 1962.

The headquarters of the party remained at Abu (Rājasthān) throughout the period under report.

78. **Personnel.**—The average strength of the party was 1 Class I Officer, 1 Class II Officer and 32 Class III personnel including Clerks.

79. **Areas Surveyed.**—

271·8 square kilometres of supplementary triangulation and post-pointing on air photographs for Ramman and Rinchingtong River Projects, Sasangada Iron Ore Deposits Project and Manipur Valley Development Project.

73·0 linear kilometres of theodolite traverse and post-pointing for Sasangada Iron Ore Deposits Project and Manipur Valley Development Project.

1,143·2 square kilometres of photo verification for the above projects and Kosi Irrigation Project.

417·8 linear kilometres of double tertiary levelling for Kosi Irrigation Project and Manipur Valley Development Project.

991·1 linear kilometres of single tertiary levelling for Manipur Valley Development Project.

28·7 square kilometres of ground verification and supplementary height control on 1 : 10,000 scale for Sasangada Iron Ore Deposits Project.

171·4 square kilometres of photo verification and supplementary height control on 2-inch scale for Manipur Valley Development Project.

8·3 square kilometres of ground verification and contouring on the ground for Ramman and Rinchingtong River Projects on 1 : 12,500 scale.

80. **Recess Work.**—Three drawing sections under the supervision of Sarva Shri S. P. Gupta (Class II), K. C. N. Rao, Surveyor and N. K. Nair, Air Survey Draftsman respectively with 7 Class III personnel in each section carried out the fair mapping of 1,422·0 square kilometre of six 1 : 50,000 scale departmental sheets.

One ira survey section under Shri N. K. Nair, Air Survey Draftsman with 9 other Class III personnel carried out the air survey of planimetry on 2-inch scale of 4,237·0 square kilometres of two 1 : 50,000 departmental sheets. They also carried out the air survey of planimetry of 28·7 square kilometres of area on 1 : 10,000 scale for Sasangada Iron Ore Deposits Projects and 7·8 and 0·5 square kilometres of area on 1½-inch scale for Ramman and Rinchingtong River Projects, respectively.

One computing section with 4 Class III personnel was engaged on the computations of supplementary triangulation and traverse of 6,369·0 square kilometres of nine 1 : 50,000 scale departmental sheets.

81. **Field Work.**—During the field season, the party was organized as follows :—

Camp (1).—Shri S. N. Mathur (Class II) with 4 Class III, personnel completed 28·7 square kilometres of ground verification and height control on air survey blue-prints for the Sasangada Iron Ore Deposits Project in Singhbhūm District of Bihār, 7·8 square kilometres of ground verification and contouring for the Ramman River Project in Darjeeling District of West Bengal and 0·5 square kilometres of ground verification and contouring for the Rinchingtong River Project in Darjeeling District of West Bengal.

Camp (2).—Shri K. C. N. Rao, Surveyor with other 11 Class III personnel completed 341·6 square kilometres of photo verification, 109·1 linear kilometres of double tertiary levelling and 199·9 linear kilometres of single tertiary levelling for the Kosi Irrigation Project area in Saharsa District of Bihār, 51·3 linear kilometres of traverse, 801·6 square kilometres of photo verification, 308·7 linear kilometres of double tertiary levelling, 791·2 linear kilometres of single tertiary levelling and 171·4 square kilometres of photo verification and supplementary height control for the Manipur Valley Development area in Manipur.

Triangulation and Traverse Detachment.—Shri Shiv Datta carried out 36·2 square kilometres of supplementary triangulation and 21·7 linear kilometres of theodolite traverse for Sasangada Iron Ore Deposits Project Area in Singhbhūm District of Bihār, 41·4 square kilometres of triangulation for Ramman River Project Area and 38·8 square kilometres of triangulation for Rinchingtong River Project area in Darjeeling District of West Bengal and 155·4 square kilometres of triangulation for Manipur Valley Development Project Area in Manipur.

82. **Technical Methods.**—As the area of surveys were covered by air photographs, usual method of air-cum-ground survey was resorted to.

83. **Description of Country.**—The areas surveyed during the period under report widely differed in their locations, terrain, vegetation, inhabitants and the languages. Brief descriptions of these areas are given below :—

(*a*) Manipur Valley Development Area consists of a stretch of open fertile plain, surrounded on all sides by high hills covered with dense jungle. A large fresh water lake, known as Logtak Lake, exists near the southern extremity of the area. The Manipur River which forms the main drainage of the valley, is channelized throughout its course through the plain, and flows into the Logtak Lake and then winds its way through the hills south of the lake.

The channeling of Manipur River and some of the lesser streams which join it, appears to have been done in some historic times for irrigation purposes and the layout and amount of excavation that was necessary for the channelization must be rated as a remarkable engineering feat.

The area is intensively cultivated and the main crop is rice. The vegetation which consists of pine and other trees with bamboo clumps mostly surround the villages.

The population is a colourful conglomeration of different tribes and cultures, such as gentler tribes like Maitis and Manipuris in the plains and fierce warlike Naga and Kukis in the hills. The people variously follow Hindu, Muslim and Christian religions while some tribes are animistic. The inhabitants of plains are generally prosperous. The women-folk, who appear more industrious than men, can weave colourful clothes, renowned for artistic designs on handlooms. The communications in the valley itself are fairly good and the area is connected by a motorable road with Manipur Road Railway Station via Kohima, the capital of Nāgāland.

The climate is cool and bracing almost throughout the year. The area receives winter rains.

(*b*) Kosi Irrigation Project area forms a part of Saharsa District of Bihār, and is known for poor communications. The area consists of cultivated plains, scarred by numerous channels of the river Kosi. It is thickly populated. The vegetation is fairly dense, mostly mango groves and clumps of bamboo.

(*c*) Ramman River Project area consists of the lower, bare slopes of a hill north-west of Darjeeling. There are quite a few villages in the area inhabited predominently by the Nepalese who are generally prosperous and the literacy among them is very high. The terrace cultivation yields excellent crops of rice and potato. There are a number of tea gardens in the vicinity. The countryside is picturesque and the climate is cold throughout the year. The area is within two days' march from Darjeeling.

(*d*) Rinchingtong River Project Area lies along a bare slope of a spur near the town of Kurseong and is very similar to the Ramman River Project Area.

(*e*) Sasangada Iron Ore Deposits Area, which forms a part of a reserved forest covering low flat hills in Singhbhūm District of Bihār, is very densely wooded and infested with wild animals like elephants, bisons, bears, boars, tigers, etc. Except for a few forest roads, the area is devoid of any communication. It can be approached by motorable road from Bara Jamda Railway Station. There is no habitation in the area except for a few forest rest houses and *chowkies*.

84. **Miscellaneous.**—Field work for small portions of Sasangada Iron Ore Deposits Project area and Ramman and Rinchingtong

River Projects areas, could not be completed due to unfavourable weather conditions.

The health of the personnel in the field was generally good.

No. 11 PARTY

Officer in charge :—Shri K. Satyanarayana, M.A.

85. General.—During recess the party was employed on preparation of spot-heighted air photo-mosaics required for flood control investigations in West Bengal.

During the field season the party was employed on the following surveys :—

(*a*) 2-inch survey of Kangsabati Project Commanded Area in West Bengal.

(*b*) Fixation of planimetric control points and establishing bench-marks on both sides of Bhāgīrathi River in West Bengal.

(*c*) Determination of alignment and mutual distances of four points on Farakka Barrage Axis, fixing geographical position of a fixed point and establishing bench-marks on both sides of Ganga River near the Barrage in West Bengal.

(*d*) Fixation of planimetric control points and establishing bench-marks along both banks of Ganga River from Mokameh Bridge to Sultānganj in Bihār.

The headquarters of the party remained at Rānchi (Bihār) throughout the period under report.

86. Personnel.—The average strength of the party was 1 Class I Officer, 1 Class II Officer, 1 Surveyor and 27 other Class III personnel including Clerks.

87. Areas Surveyed.—

777·0 square kilometres of ground verification on 2-inch scale blue-prints and height control.

1,047·9 linear kilometres of theodolite traverse.

1,119·3 linear kilometres of double tertiary levelling.

1,562·3 linear kilometres of single tertiary levelling.

4,002·0 square kilometres of spot-heighting of air photo-mosaics on 4-inch scale.

88. Recess Work.—Shri J. K. Chatterjee (Class II) with 7 Class III personnel completed preparation of 4-inch scale spot-heighted air photo-mosaics of an area of 2,117·0 square kilometres and Shri S. C. Ghosh, Surveyor with 6 Class III personnel completed similar photo-mosaics of an area of 1,885·0 square kilometres. The areas covered by these mosaics fall in Burdwān, Hooghly, Howrah and Midnapore Districts of West Bengal.

Shri J. K. Chatterjee (Class II) with 7 Class III personnel completed computations of heights in the area surveyed in 1961-62 field season.

89. **Field Work.**—The field work was organized as follows :—

Camp (1).—Shri J. K. Chatterjee (Class II) assisted by 1 Surveyor with 14 Class III personnel completed 777·0 square kilometres of ground verification on 2-inch scale blue-prints and height control, 122·5 linear kilometres of theodolite traverse, 417·3 linear kilometres of double tertiary levelling and 1,562·3 linear kilometres of single tertiary levelling for 2-inch survey of Kangsabati Project Commanded Area in Midnapore District of West Bengal. The same camp completed 583·3 linear kilometres of theodolite traverse and 341·5 linear kilometres of double tertiary levelling for fixing planimetric control points and bench-marks on both sides of Bhāgīrathi River in Burdwān, Murshidābād Districts of West Bengal, and 40·2 linear kilometres of theodolite traverse in Santāl Parganas District of Bihār and Mālda and Murshidābād Districts of West Bengal and 31·4 linear kilometres of double tertiary levelling in Mālda and Murshidābād Districts of West Bengal in connection with the Barrage Axis, fixing mutual distances of four points on the axis and a pair of points lying on opposite banks of Ganga River, and establishing bench-marks on both sides of the river near Farakka Barrage.

Camp (2).—Shri S. C. Ghosh, Surveyor with 2 Class III personnel completed 301·9 linear kilometres of theodolite traverse and 329·1 linear kilometres of double tertiary levelling for fixing planimetric control points about 1·6 kilometres apart and establishing bench-marks at about the same interval on both banks of Ganga River from Mokameh Bridge to Sultānganj in Bhāgalpur, Monghyr and Patna Districts of Bihār.

90. **Technical Methods.**—(*a*) *Mokameh and Bhāgīrathi Projects.*—Usual theodolite traverse by crinoline chains and double tertiary levelling were done to meet the needs of the Indentor.

(*b*) *Kangsabati Project Commanded Area Survey.*—Usual method of blue-print verification on the enlarged one-inch map of the area and height control by a network of levelling lines for 2 feet contours survey and clinometric heights for steep area were carried out.

(*c*) *Farakka Project.*—The survey work for this project involved the following tasks :—

(*i*) Finding of mutual distances of four fixed points on the axis and a pair of points lying on the opposite banks of the Ganga River.

(*ii*) Determination of the bearing of the Barrage Axis from a fixed point.

(*iii*) Setting one line of about a mile long at right angles to the Barrage Axis from a fixed point on the right

bank and measuring distances between fixed points on this line.

(*iv*) Fixing of bench-marks on both sides of the river near the ends of the Barrage Axis.

The bearing of the Barrage Axis was found by Polaris observations, the mutual distances of the fixed points on the axis by Hunter Short Base extension and direct measurement by crinoline chain and the bench-marks by double tertiary levelling.

91. **Description of Country.**—The area of survey near about Mokameh Bridge in Bihār consists of flat cultivated plains with numerous villages and fairly dense vegetation.

The Kangsabati Project Commanded Area in West Bengal consists of undulating ground partly open and cultivated and partly covered with dense scrub and jungle.

The area on both sides of the Bhāgīrathi River in West Bengal consists of cultivated flat plains with numerous trees and villages.

The area near Farakka Barrage in West Bengal consists of flat swampy plains with mango orchards and some villages.

92. **Miscellaneous.**—The health of all personnel remained satisfactory. Frequent outbreak of violent storms from the middle of April presented a serious handicap to the field work which was unusually prolonged in Midnapore District of West Bengal.

No. 18 PARTY

Officer in charge:—Shri M. R. Rao, M.A.

93. **General.**—The party was employed on the following extra-departmental mapping and surveys which were sponsored by the Governments of Assam, Bihār and West Bengal and the Director-General, Civil Aviation, New Delhi in widely scattered areas of Assam, Bihār and West Bengal States.

(*a*) Landing and Approach Charts surveys on I.C.A.O. Specifications for Rupsi, Cooch Behār, Bālurghāt and Mālda Aerodromes.

(*b*) Umtru Hydel Project, Stages IV and V.

(*c*) Grid Layout of Patratu Thermal Power Station.

(*d*) Mawphlang Hydro Electric Project (fair mapping only).

(*e*) Umiam Hydel Projects, Stage III (fair mapping only).

(*f*) Kangsabati and Dwarkeshwar Valley Project (fair mapping only).

The party headquarters was transferred from Shillong (Assam) to Rānchi (Bihār) with effect from 24th July 1962.

94. **Personnel.**—The strength of the part ywas 1 Class I Officer, 2 Class II Officers, 2 Class III Division I Officers and 29 other Class III personnel including Clerks and M.T. Drivers.

95. **Areas Surveyed.**—

169·9 square kilometres of blue-print revision surveys on 1 : 50,000 scale maps for I.C.A.O. surveys.

7,681·9 square kilometres of verification surveys on ¼-inch scale for the above.

300·3 linear kilometres of theodolite traverse for the above.

197·3 linear kilometres of single tertiary levelling for the above.

32·0 linear kilometres of double tertiary levelling for the above.

128·9 square kilometres of ground verification and contouring on 2-inch scale for Umtru Project, Stages IV and V.

129·5 square kilometres of supplementary triangulation for the above.

8·0 hectares of rectangulation for grid layout of Patratu Thermal Power Station.

96. **Recess Work.**—Three sections under Sarva Shri I. C. Deb (Class II) assisted by Shri Oshea Lyngdoh, Survey Assistant, B. R. Bose (Class II) and S. Guha Roy, Surveyor were engaged on air survey and fair mapping of sheets of Kangsabati and Dwarkeshwar Valley Project, Umiam Hydel Project, Stage III and Mawphlang Hydro Electric Project. Field computations of 1961–62 field season were duplicated.

97. **Field Work.**—The field work was organized and completed as given below :—

(*a*) *I.C.A.O. Surveys.*—Shri I. C. Deb (Class II) with 5 Class III personnel completed 169·9 square kilometres of blue-print revision survey on 1 : 50,000 scale enlargements of modern 1-inch maps, 7,681·9 square kilometres of verification surveys on ¼-inch scale, 300·3 linear kilometres of theodolite traverse, 32·0 linear kilometres of double tertiary levelling and 197·3 linear kilometres of single tertiary levelling.

(*b*) *Umtru Project, Stages IV and V.*—Shri R. K. Kapur (Class II) with 5 Class III personnel completed 128·9 square kilometres of ground verification and contouring on blue-prints of 2-inch scale air survey planimetry and 129·5 square kilometres of supplementary triangulation.

(*c*) *Grid Layout of Patratu Thermal Power Station.*—Shri C. K. P. Unni, Surveyor, completed 8 hectares of rectangulation.

98. **Technical Methods.**—The technical methods were chosen and adopted to suit the particular requirements of survey and the nature of ground ; the more important aspects of them are outlined below :—

(*a*) *I.C.A.O. Surveys.*—Normal method of plane-tabling on 1 : 50,000 blue-prints, obtained from enlargement of the existing

one-inch map of the area, was carried out according to I.C.A.O. specifications. The heights of hazards to aeronautical navigation were determined from vertical angles read by theodolite and horizontal distances scaled off from plane-table sections. Contouring of the area was based on levelling lines which in turn were based on precision levelling bench-marks as existing in the area.

(*b*) *Umtru Project, Stages IV and V.*—As the areas were covered by photography, normal method of air-cum-ground survey was resorted to. Being thickly jungle-clad, height traverses in it were carried out by means of clinopoles, with mirrors fixed at heights of 4 feet, 12 feet and 14 feet with suitable inclination to reflect sun rays towards the Plane-tabler.

(*c*) *Grid Layout of Patratu Thermal Power Station.*—The job was carried out by a combination of triangulation and traverse methods using chain pins for signals at stations.

99. Description of Country.—(*a*) *I.C.A.O. Surveys.*—The areas of survey are in most of the cases limited by the Indo-Pākistān boundary. The terrain is flat, open, cultivated plains interspersed with jungle patches. The famous Mālda mango is found in abundance in and around the Landing Chart Area of the Mālda Aerodrome. Guma Reserved Forest and other dense mixed jungles, preponderant in *sal*, occur in the northern and eastern regions of Rupsi Landing and Approach Charts. The areas abound in roads, railway tracks, villages and townships. National Highways Nos. 31 and 34 also pass through these areas.

(*b*) *Umtru Project, Stages IV and V.*—The areas are contiguous and consist of densely wooded intricate hills with thick undergrowth at places and abound in wild life such as the elephant, snake and deer. It is infested with leeches, which work havoc especially after a few showers of rain. There are very few villages and mainly foot-paths serve as means of communications. However, five fair-weather unmetalled forest roads, emanating from Gauhāti–Shillong road, connect the areas of Nongbir Villages and form good approaches for the southern portion of the fifth stage area and northern and western portions of the fourth stage area. A similar forest road, leading from milestone No. 33 on the Gauhāti–Shillong Road and connecting Umtesar Village, forms a good approach to the eastern and southern portions of the fourth stage area. A cart-track leading from milestone No. 20 on the Gauhāti–Shillong Road connects Sokhwai Village in the fifth stage area. Porters are available locally but could be obtained only with a little pursuasion through the village headman as they are usually not keen on employment.

(*c*) *Grid Layout of Patratu Thermal Power Station.*—The area rectangulated was open and undulating.

100. Miscellaneous.—The health of field personnel remained generally good.

VI. SURVEY REPORTS, SOUTHERN CIRCLE

DIRECTOR:—{Shri L. J. Bagnall, B.SC., to 19–12–62.
Shri J. C. Ross, A.R.I.C.S., M.I.S., from 20–12–62.

DEPUTY DIRECTOR:—Shri L. J. Bagnall, from 25–5–62.

Note.—The post of Deputy Director was transferred to Northern Directorate for the period 5–3–62 to 24–5–62.

101. **Summary.**—No. 34 Party was raised with effect from 16–8–62. Nos. 10 and 34 Parties were transferred to the administrative control of the Director, Training Directorate, with effect from 15th November 1962.

102. **Areas Surveyed.**—

793·3 square kilometres of 1 : 25,000 original ground survey.

1,496·0 square kilometres of ground verification and contouring for 1 : 25,000 departmental survey.

249·1 square kilometres of 4-inch original ground survey.

8·8 square kilometres of 1 : 10,000 original ground survey.

27·7 square kilometres of 8-inch original ground survey.

338·9 square kilometres of 1 : 50,000 blue-print revision survey.

287·7 square kilometres of photo verification and height control on 2-inch scale.

2,862·9 square kilometres of 2-inch original air survey and fair mapping.

14,217·7 square kilometres of verification of office copy corrections.

1,479·0 square kilometres of 1 : 25,000 air survey of planimetry only.

5,038·6 square kilometres of triangulation.

310·0 square kilometres of subsidiary triangulation.

449·8 linear kilometres of theodolite traverse.

1,640·0 linear kilometres of double tertiary levelling.

2,020·1 linear kilometres of single tertiary levelling.

No. 8 PARTY

Officer in charge :—Shri V. K. Pai, B.A. (Hons.).

103. **General.**—The party carried out the following departmental and extra-departmental surveys and mapping during the year :—

(*a*) *Departmental.*—

(*i*) Triangulation for 1 : 25,000 original survey in Goa, Mahārāshtra and Mysore.

(*ii*) Planimetric and height control, blue-print revision survey on 1 : 50,000 scale and ¼-inch verification of office copy corrections for the Landing and Approach Charts of Warangal Aerodrome in Andhra Pradesh, Trivandrum Aerodrome in Kerala, Madurai and Tiruchchirāppalli Aerodromes in Madras and Bangalore, Belgaum and Mysore Aerodromes in Mysore and planimetric control for the Landing Chart of Bilāspur Aerodrome in Madhya Pradesh.

(*iii*) Fair mapping of 1 sheet on 1 : 50,000 scale falling in Andhra Pradesh.

(*b*) *Extra-departmental.*—

(*i*) Photo verification and height control on 2-inch scale for Balimela Reservoir in Andhra Pradesh and Orissa. Planimetric and height control and original ground survey for Balimela Dam (on 8-inch scale), Balimela Tunnel (on 4-inch scale) and Tikarpāra Dam (on 8-inch scale) in Orissa. Planimetric and height control for Balimela Commanded Area in Orissa.

(*ii*) Fixing of 2 control points in Kerala.

The headquarters of the party remained at Bangalore (Mysore) throughout the period under report.

104. **Personnel.**—The average strength of the party was 1 Class I Officer, 3 Class III Division I Officers and 24 other Class III personnel including 4 Clerks.

105. **Areas Surveyed.**—

27.7 square kilometres of 8-inch original ground survey.

13.1 square kilometres of 4-inch original ground survey.

338.9 square kilometres of 1 : 50,000 blue-print revision survey.

72.5 square kilometres of photo verification and height control on 2-inch scale.

1,282·9 square kilometres of original air survey and fair mapping on 2-inch scale.

14,217·7 square kilometres of verification of office copy corrections on $\frac{1}{4}$-inch scale.

4,634·6 square kilometres of triangulation.

138·8 linear kilometres of theodolite traverse.

869·0 linear kilometres of double tertiary levelling.

378·5 linear kilometres of single tertiary levelling.

106. Recess Work.— Recess work was organised as below :—

Section I.—Shri P. S. Bains (Class II) and later Shri V. B. Potdar, Surveyor with 10 other Class III personnel, carried out original air survey and fair mapping on 2-inch scale of 9 sheets of Narmada Commanded Area and fair mapping of one 1 : 50,000 sheet. The departmental sheet was later transferred to No. 4 Drawing Office for completion.

Section II.—Shri K. Ranga Rao (Class II) and later Shri V. B. Potdar with 9 other Class III personnel, carried out original air survey and fair mapping on 2-inch scale of 8 sheets of Narmada Commanded Area.

107. Field Work.—The field work was organised as below :—

(*a*) *Camp I.*—Shri R. S. Ramamoorthy, Surveyor with 12 other Class III personnel completed the following :—

(*i*) 72·5 square kilometres of photo verification and height control on 2-inch scale for Balimela Reservoir in Vishākhapatnam District of Andhra Pradesh and Koraput District of Orissa.

(*ii*) 5·7 square kilometres of triangulation, 4·0 linear kilometres of theodolite traverse, 10·8 linear kilometres of single tertiary levelling and 5·7 square kilometres of original ground survey on 8-inch scale for Balimela Dam, 20·3 linear kilometres of theodolite traverse, 44·9 linear kilometres of double tertiary levelling, 5·9 linear kilometres of single tertiary levelling and 13·1 square kilometres of original ground survey on 4-inch scale for Balimela Tunnel and 512·0 square kilometres of triangulation, 65·5 linear kilometres of theodolite traverse, 245·1 linear kilometres of double tertiary levelling and 258·7 linear kilometres of single tertiary levelling for Balimela Commanded Area in Koraput District of Orissa.

(*iii*) 22·0 square kilometres of triangulation, 42·4 linear kilometres of theodolite traverse, 90·5 linear kilometres of double tertiary levelling, 41·4 linear kilometres of single tertiary levelling and 22·0 square kilometres of original ground survey on 8-inch scale for Tikarpāra Dam in Baudh and Dhenkānāl Districts of Orissa.

(*b*) *Independent detachments.*—

(*i*) Shri Gurcharan Singh, Surveyor completed 1,399·0 square kilometres of triangulation for 1 : 25,000 original survey in Goa and Ratnagiri District of Mahārāshtra.

(*ii*) Shri K. Ananthanarayan, Surveyor completed 932·0 square kilometres of triangulation for 1 : 25,000 original survey in Goa and Belgaum District of Mysore.

(*iii*) Shri A. P. Tripathi, Topo Trainee Type 'A' completed 800·0 square kilometres of triangulation for 1 : 25,000 original survey in Goa, 27·0 square kilometres of triangulation for the Landing Chart of Mysore Aerodrome in Mysore District of Mysore and fixing of 2 control points for checking up the linear accuracy of survey for the Kerala Government in Calicut (Kozhikode) District of Kerala.

(*iv*) Shri P. S. Sandhu, Topo Trainee Type 'A' completed 43·8 square kilometres of triangulation for the Landing Chart of Belgaum Aerodrome in Belgaum District of Mysore, 40·3 square kilometres of triangulation for the Landing Chart of Bilāspur Aerodrome in Bilāspur District of Madhya Pradesh, 43·4 square kilometres of triangulation for the Landing Chart of Warangal Aerodrome in Warangal District of Andhra Pradesh, 40·3 square kilometres of triangulation for the Landing Chart of Madurai Aerodrome in Madurai District of Madras and 585·0 square kilometres of triangulation for 1 : 25,000 original survey in Goa, and Kārwār District of Mysore.

(*v*) Shri P. R. George, Plane-tabler completed 13·0 square kilometres of triangulation, 189·2 linear kilometres of double tertiary levelling, 5·6 linear kilometres of single tertiary levelling and 40·3 square kilometres of 1 : 50,000 blue-print revision survey for the Landing Chart of Mysore Aerodrome in Mysore District of Mysore, 2,030·6 square kilometres of ¼-inch verification of office copy corrections for the Approach Chart of Mysore Aerodrome in Mysore and Mandya Districts of Mysore, 16·6 linear kilometres of double tertiary levelling and 43·8 square kilometres of 1 : 50,000 blue-print revision survey for the Landing Chart of Belgaum Aerodrome in Belgaum District of Mysore and 2,295·6 square kilometres of ¼-inch verification of office copy corrections for the Approach Chart of Belgaum Aerodrome in Belgaum District of Mysore. He was assisted by 3 other Class III personnel for about a month to complete double tertiary levelling for the Landing Chart of Mysore Aerodrome.

(*vi*) Shri H. N. Rao, Plane-tabler completed 44·9 square kilometres of triangulation, 6·0 linear kilometres of single tertiary levelling and 44·9 square kilometres of 1 : 50,000 blue-print revision survey for the Landing Chart of Tiruchchirāppalli Aerodrome in Tiruchchirāppalli District of Madras, 2,237·9 square kilometres of ¼-inch verification of office copy corrections for the Approach Chart of Tiruchchirāppalli Aerodrome in Thanjāvūr and Tiruchchirāppalli Districts of Madras, 28·6 linear kilometres of double tertiary levelling, 15·2 linear kilometres of single tertiary levelling and 40·3 square kilometres of 1 : 50,000 blue-print revision survey for the Landing Chart of Madurai Aerodrome in Madurai District of Madras and 2,030·6 square kilometres of ¼-inch verification of office copy corrections for the Approach Chart of Madurai Aerodrome in Rāmanāthapuram and Madurai Districts of Madras.

(*vii*) Shri I. N. Shariff, Plane-tabler completed 23·0 square kilometres of triangulation, 2·9 linear kilometres of theodolite traverse, 71·5 linear kilometres of double tertiary levelling, 7·4 linear kilometres of single tertiary levelling and 23·0 square kilometres of 1 : 50,000 blue-print revision survey for the Landing Chart and 1,127·2 square kilometres of ¼-inch verification of office copy corrections for the Approach Chart of Trivandrum Aerodrome in Trivandrum District of Kerala. He also completed 103·2 square kilometres of triangulation, 3·7 linear kilometres of theodolite traverse, 22·3 linear kilometres of single tertiary levelling and 103·2 square kilometres of 1 : 50,000 blue-print revision survey for the Landing Chart of Bangalore Aerodrome in Bangalore Urban District of Mysore and 2,465·2 square kilometres of ¼-inch verification of office copy corrections for the Approach Chart of Bangalore Aerodrome in Bangalore Rural and Urban Districts of Mysore.

(*viii*) Shri S. S. Sharfuddin, Plane-tabler completed 236·6 linear kilometres of double tertiary levelling, 5·2 linear kilometres of single tertiary levelling, 43·4 square kilometres of 1 : 50,000 blue-print revision survey for the Landing Chart of Warangal Aerodrome in Warangal District and 2,030·6 square kilometres of ¼-inch verification of office copy corrections for the Approach Chart of the same aerodrome in Karimnagar and Warangal Districts of Andhra Pradesh.

108. Technical Methods.—The 8-inch surveys for Balimela and Tikarpāra Dams and the 4-inch survey for Balimela Tunnel

were required by the Public Works Department (Irrigation), Government of Orissa, for investigation and planning of the Tikarpāra and Balimela Hydro-electric Projects. The planimetric control for these surveys was carried out by triangulation and theodolite traverse and the height control by double and single tertiary levelling. The surveys were executed by normal plane-tabling method. With a view to treat the plane-table sections themselves as contour originals, the contours were drawn in black and detail in blue. The second original was prepared on kodatrace by tracing the detail.

Surveys for Landing and Approach Charts were carried out by normal plane-tabling method adopted for blue-print and verification surveys except that the heights of all hazards were observed by theodolite to obtain the requisite accuracy.

109 Description of Country.—The area of the Balimela Project consists of low, undulating and intricate hills mostly covered by bamboo, teak and other trees with heavy undergrowth. Part of the area (within about 10 kilometres of the banks of the Sileru River) is covered by thick bamboo clumps and mixed jungle. A large amount of wild life such as tiger, panther, bear, wild buffalo, etc., are seen in the forest. There is also a fear of man-eaters in the Commanded Area.

The villages in the area are few and far between and officers had to camp in jungle on the banks of streams. Communications in the area are scanty. The few existing unmetalled roads and cart-tracks are not motorable till November as most of the streams and rivulets make them unfordable.

The areas covered by the various aerodrome surveys are undulating with low hills covered by open jungle or groves of coconut and fruit trees with many motorable roads and tracks.

The area of the 1 : 25,000 triangulation (for the survey of Goa) consists of steep hills of the Western Ghāts and an undulating coastal belt covered by coconut and cashewnut groves. Apart from a few roads connecting main towns and villages, communications in the area are poor.

The area of the Tikarpāra Dam consists of low hills on the banks of the Mahānadi River, covered by open mixed jungle, interspersed with patches of cultivation and with fairly good means of communication. A large variety of wild life such as tiger, wild buffalo, elephant, etc., are seen in the forest.

No. 17 PARTY

Officer in charge :—{Shri Muneendra Kumar, M.Sc., to 10-6-62 and from 13-8-62
{Shri V. K. Pai, B.A. (Hons.), from 11-6-62 to 12-8-62.

110. General.—The party was engaged mainly on the following work :—

Fair mapping of 4-inch Narmada Reservoir sheets for the Government of Gujarāt.

Ground verification and contouring on 1 : 25,000 scale for departmental surveys in Mysore and Mahārāshtra.

Original ground survey on 1 : 25,000 scale for departmental surveys in Mysore and Andhra Pradesh.

The party headquarters remained at Bangalore (Mysore) throughout the period under report.

111. **Personnel.**—The average strength of the party was 1 Class I Officer, 2 Class II Officers, 1 Class III Division I Officer and 31 other Class III personnel including 4 Clerks and 3 Drivers.

112. **Areas Surveyed.**—

248·0 square kilometres of 1 : 25,000 original ground survey.

1,126·0 square kilometres of ground verification and contouring for 1 : 25,000 departmental survey.

113. **Recess Work.**—The party was organised into two fair mapping sections and one computing section as follows :—

Section I.—Shri K. N. S. K. Pillai (Class II) with 8 Class III personnel completed the fair mapping of four 4-inch sheets of Narmada Reservoir in Baroda and Broach Districts of Gujarāt, West Khāndesh District of Mahārāshtra and Dhār, Jhābua and West Nimār Districts of Madhya Pradesh.

Section II.—Shri V. Raghavan (Class II) with 9 Class III personnel completed the fair mapping of six 4-inch sheets of Narmada Reservoir in Baroda and Broach Districts of Gujarāt, West Khāndesh District of Mahārāshtra and Dhār, Jhābua and West Nimār Districts of Madhya Pradesh.

This section also completed the air survey of planimetry on 2-inch scale for departmental sheet 65 E/11 in Bastar District of Madhya Pradesh.

Section III.—Shri K. Ananthanarayan, Surveyor with 1 Surveyor and 2 Computers carried out the computations of the following :—

(*i*) Narmada Reservoir.

(*ii*) Mangalore Aerodrome.

(*iii*) Triangulation in sheet 65 A.

114. **Field Work.**—The party was organised into three camps and one fair mapping section as follows :—

Camp I.—Shri K. N. G. K. Iyengar, Surveyor with 10 other Class III personnel completed 560·0 square kilometres of ground verification and contouring on blue-prints and 124·0 square kilometres of original ground survey on 1 : 25,000 scale for departmental mapping in Anantapur District of Andhra Pradesh, Kolhāpur District of Mahārāshtra and Belgaum and Kolār Districts of Mysore.

Camp II.—Shri V. B. Potdar, Surveyor with 9 other Class III personnel completed 566·0 square kilometres of ground verification and contouring on 1 : 25,000 scale for departmental mapping in Balgaum District of Mysore.

Camp III.—Shri V. K. Nagar (Class I) with 6 Class III personnel completed 124·0 square kilometres of original ground survey on 1 : 25,000 scale for departmental mapping in Anantapur District of Andhra Pradesh and Kolār District of Mysore.

Drawing Section.—Shri C. R. Basu (Class II) with 4 Class III personnel completed the fair mapping of four 4-inch sheets of Narmada Reservoir covering an area of 143 square kilometres in Baroda and Broach Districts of Gujarāt, West Khāndesh District of Mahārāshtra and Dhār, Jhābua and West Nimār Districts of Madhya Pradesh.

115. **Technical Methods.**—

The 1 : 25,000 scale original ground survey with contours at a vertical interval of 10 metres was carried out by the usual plane-tabling method.

The 1 : 25,000 scale ground verification and contouring on blue-print at a vertical interval of 10 metres was carried out by normal air-cum-ground method.

116. **Description of Country.**—The area for ground verification and contouring consisted of open, gently undulating, cultivated plains and flat, jungle-covered, moderately high hills in the south. There are no wild animals in the jungle which abounds in sandal wood trees. The river Ghātprabha flows in the centre of the area and is fordable at a number of places from November to June; there are also two low level and two all-weather bridges on it.

The whole area has many metalled and unmetalled roads with the Bangalore–Poona National Highway in the west. Cart-tracks are mostly jeepable. The Bangalore–Poona metre gauge railway also runs through the area which is full of villages.

The area for original ground survey consisted of open, cultivated plains with scattered, rocky outcrops and boulders in the western half and rocky hills with scattered cultivation patches in the eastern half.

Cultivation is mainly dependent on tanks and a few canals emanating from some of the perennial tanks. A number of metalled and unmetalled roads traverse the area.

117. **Miscellaneous.**—The health of personnel, in general, was satisfactory.

Labour, conveyance and rations were readily available in most of the villages. Motor transport could ply in the area without any difficulty.

No. 21 PARTY

Officer in charge :—
- Major P. M. Mani, B.SC. (Civil Engg.), A.M.I.E., Engineers, to 7–7–62 and from 13–8–62 to 2–12–62.
- Major A. S. Iyer, B.E. (Hons.) Civil, A.M.I.E., Engineers, from 8–7–62 to 9–7–62.
- Shri R. S. Chugh, M.A., A.M.I.S., from 10–7–62 to 12–8–62.
- Shri J. Narasimhan, B.SC. (Hons.), from 3–12–62.

118. General.—The unit was employed on 1 : 25,000 scale original departmental surveys.

The headquarters of the party remained at Bangalore (Mysore) throughout the period under report.

119. Personnel.—The average strength of the party was 1 Class I Officer, 1 Class II Officer, 1 Class III Division I and 27 other Class III personnel including 4 Clerks and 2 Drivers.

120. Areas Surveyed.—

370·0 square kilometres of ground verification and contouring for 1 : 25,000 departmental survey.

499·0 square kilometres of 1 : 25,000 original ground survey.

310·0 square kilometres of subsidiary triangulation for 1 : 25,000 original ground survey.

26·0 linear kilometres of theodolite traverse for 1 : 25,000 original air-cum-ground survey.

121. Field Work.—The field work was organised as follows :—

Camp I.—Shri P. S. Bains (Class II) with 5 Class III personnel completed 370·0 square kilometres of 1 : 25,000 scale original survey by ground verification and contouring on blue-prints from air survey of sheets 47 L/16/1, 2 and 4 in Belgaum District of Mysore.

Shri C. N. Rao, Computer under the supervision of Shri P. S. Bains, completed 26 linear kilometres of theodolite traverse for part of the above 1 : 25,000 survey in sheet 47 L/16 in Belgaum District of Mysore.

Camp II.—Shri A. Ramachandran, Surveyor with 8 other Class III personnel completed 499·0 square kilometres of 1 : 25,000 scale original ground survey of sheets 57 G/10/2, 3, 5 and 6 in Kolār District of Mysore.

Shri T. N. Tirunarayanan, Computer under the supervision of Shri A. Ramachandran, completed 310·0 square kilometres of subsidiary triangulation for part of the above 1 : 25,000 survey in sheet 57 G/10 in Anantapur District of Andhra Pradesh and Kolār District of Mysore.

122. Technical Methods.—All the surveys were done by normal ground and air survey methods.

123. Description of Country.—The Gokāk (Belgaum District) area of original survey by air-cum-ground method consists of flat,

scrub-covered hills rising to 750 metres above mean sea-level towards the south-west, and gently undulating plains of black, cotton soil 550 metres above mean sea-level, traversed by streams and of completely cultivated land towards the north-east. The Ghātprabha River flows west to east in the area.

The Gauribidanur (Kolār District) area of original survey by ground methods consists of intricate, rocky, scrub-covered hills rising to 1,200 metres above mean sea-level towards the east, undulating plains 700 metres above mean sea-level, interspersed with streams and tanks and mostly cultivated land with a fairly dense growth of trees towards the west.

In both areas, communication was easy along the large number of roads and cart-tracks. In the hilly portions, however, due to lack of cart-tracks, porters had to be employed for shifting camp.

124. Miscellaneous.—The health of the personnel ramained good throughout.

No. 24 PARTY

Officer in charge :— Major A. S. Iyer, B.E. (Hons.) Civil, A.M.I.E., Engineers, to 11–7–62.
Shri R. S. Chugh, M.A., A.M.I.S., from 12–7–62 to 9–8–62.
Shri T. K. Guruswamy, M.A., from 10–8–62.

125. General.—During recess the party carried out 2-inch air survey and fair mapping of part of Narmada Commanded Area.

During the field season, the party was engaged on the following surveys :—

Original ground survey on 1 : 25,000 scale and photo verification and height control on 2-inch scale for the Hogenakal Project in Madras and Mysore.

Original ground survey on 4-inch scale for the reservoir and on 1 : 10,000 scale for the tunnel, penstock and generating station of the Bedti Project in Mysore.

The headquarters of the party remained at Bangalore (Mysore) throughout the period under report.

126. Personnel.—The average strength of the party was 1 Class I Officer, 2 Class III Division I Officers and 28 other Class III personnel including 5 Clerks and 2 Drivers.

127. Areas Surveyed.—

1,580·0 square kilometres of original air survey and fair mapping on 2-inch scale.

1,479·0 square kilometres of air survey of planimetry on 1 : 25,000 scale.

404·0 square kilometres of triangulation for supplementary control of surveys for Bedti Project.

285·0 linear kilometres of theodolite traverse.

771·0 linear kilometres of double tertiary levelling.

1,213·7 linear kilometres of single tertiary levelling.

427·9 linear kilometres of subsidiary single tertiary levelling.

215·2 square kilometres of supplementary height control photo verification and post-pointing of existing control, points on 2-inch scale air photographs.

46·3 square kilometres of original plane-tabling on 1 : 25,000 scale.

236·0 square kilometres of original plane-tabling on 4-inch scale.

8·8 square kilometres of original plane-tabling on 1 : 10,000 scale.

128. Recess Work.—The party was organised for computations, drawing and air survey into two sections, as below :—

Section I.—Shri T. R. Santhanaraman (Class II) assisted by Sarva Shri K. N. Ramanathan and K. V. Krishnamurty, Surveyors commenced the air survey compilation and fair mapping of Narmada Commanded Area sheets. This section continued its work under Shri K. V. Krishnamurty, Surveyor with 11 other Class III personnel and completed the work, covering an area of 877·0 square kilometres. This section also completed 1,479·0 square kilometres of air survey of planimetry on 1 : 25,000 scale of sheets 47 L/12 and 16. Computation of 64·0 linear kilometres of traverse, 287·0 linear kilometres of double tertiary levelling and 64·0 linear kilometres of single tertiary levelling was also done by this section.

Section II.—Shri S. N. Setlur, Surveyor (Selection Grade) assisted by Shri K. N. Ramanathan with 7 other Class III personnel, completed the air survey and fair mapping of Narmada Commanded Area sheets covering 703·0 square kilometres. Computation of 200·0 linear kilometres of double tertiary levelling and 50 ·0 linear kilometres of single tertiary levelling was also done by this section.

129. Field Work.—The party was organised for field work into two camps, as below :—

Camp I.—Shri S. N. Setlur with 12 other Class III personnel completed 404·0 square kilometres of triangulation for supplementary control, 239·6 linear kilometres of theodolite traverse, 634·7 linear kilometres of single tertiary levelling, 277·2 linear kilometres of subsidiary single tertiary levelling, 236·0 square kilometres of original plane-tabling on 4-inch scale for the reservoir and

8·8 square kilometers of original plane-tabling on 1 : 10,000 scale for the tunnel, penstock and the power station of the Bedti Project in North Kanara and Dhārwār Districts of Mysore.

Camp II.—Shri K. V. Krishnamurty with 8 other Class III personnel completed 45·4 linear kilometres of theodolite traverse, 771·0 linear kilometres of double tertiary levelling, 579·0 linear kilometres of single tertiary levelling, 150·7 linear kilometres of subsidiary single tertiary levelling, 215·2 square kilometres of supplementary height control, photo verification and post-pointing of existing control points on 2-inch scale air photographs, 14·2 square kilometres of original plane-tabling on 1 : 25,000 scale and 32·1 square kilometres of original plane-tabling on 1 : 25,000 scale in connection with the survey of the Hogenakal Reservoir in Coimbatore and Salem Districts of Madras and Bangalore Rural and Mysore Districts of Mysore.

130. **Technical Methods.**—For the Bedti Project, the submergence area was surveyed on 4-inch scale on the ground and the tunnel and penstock areas were surveyed on 1 : 10,000 scale. Both surveys were on the metric system, the contours being at 2·5 and 5 metre vertical intervals above and below the 430-metre contour, respectively. During the ground survey, the available forest maps on 4-inch scale on the old style, surveyed prior to 1900, were utilised and detail from these maps were transferred to the plane-table sections for verification. Available photographs on 2-inch scale were used to incorporate details. The areas were rigorously surveyed on the ground by plane-table traverse, to control which adequate plan and height control were provided in the early part of the season. Surveying the area on 1 : 25,000 scale adhering to the specifications for contour intervals by using air photographs only, is not possible.

For the Hogenakal Project, the available 2-inch photographs were post-pointed for trigonometrical control and verified on the ground for detail. During the verification of these photographs, height control points were provided on them, approximately ½-inch apart, based on adequate spirit levelling of suitable accuracy specially carried out for this purpose, in the earlier part of the season. Height control charts were maintained on 1 : 25,000 scale to facilitate provision of height control points of suitable density.

A sizeable part of the area was surveyed on the ground on 1 : 25,000 scale. Contours were surveyed at 2·5 and 5 metre vertical intervals below and above the 250-metre contour, respectively. The original plane-tabling required provision of supplementary planimetric control also, which was done by carrying out traverse (with traverse stations and intersected points along a narrow belt), extending 1 mile on either side of the Cauvery River.

131. **Description of Country.**—The area of survey for the Bedti Project in North Kanara and Dhārwār Districts consists of low, undulating, intricate hills, mostly covered with dense teak, rosewood, bamboo, cane and other trees interspersed with high

grass and heavy undergrowth. The entire area is covered with bamboos of varying heights, which grow more luxuriently in the valley floors than on the spurs, thereby making the valleys appear more shallow than they really are. Villages in this region are small and they are spread out far apart, generally in the flat valley floors at the source of streams. The villages are surrounded by cultivated areas of paddy and sugarcane, groves of areca nuts, betel gardens and plantations of cardamom and pepper. The villages are connected by rugged cart tracks which are jeepable in dry season. The owners of the cultivation are generally Bhats, Nayaks or Shettys, while the labourers hail from a tribe called Siddhis, who have migrated from the adjoining area in Goa, where, presumably, they had been brought from Africa by the Portuguese settlers.

Labour is scarce throughout the area and even when obtained, local labourers demand very high wages besides working reluctantly and unwillingly.

Inside the deciduous portions of the forested area the visibility improves to some extent due to the falling of leaves and the burning of undergrowth. After the onset of the monsoon in June, till the next January, the conditions inside the forest are bad, due to moisture and the presence of leeches, ticks, forest flies, other insects and snakes in large numbers. Wild animals of all sorts are known to be in abundance in the area. The area never gets very hot. Nights are usually cool and the maximum shade temperature seldom exceeds 32°C.

The area of survey for the Hogenakal Project consists of deep valleys of the Cauvery River and its tributaries. These valleys are heavily wooded except in the vicinity of some villages on the river banks, situated five to six miles apart. Communications are rather poor and coracles (locally called *parisals*) are used on the river. Cultivation in the bed of the river is periodical ; it commences in December (when the water recedes and there are standing crops) and continues till the freshets arrive. The reserved forest on the western bank of the river is infested with wild elephants. The entire area with its picturesque scenery echoes with legendary folk tales and narratives about the current menace from dacoits.

VII. SURVEY REPORTS, WESTERN CIRCLE

DIRECTOR :—Colonel C. M. Sahni, B.A.

DEPUTY DIRECTOR :—Lt.-Colonel D. N. Sharma Atri Harnal, Engineers, to 17-6-62.
Colonel C. M. Sahni, B.A., from 18-6-62 to 30-7-62 (additional charge).
Shri P. S. Shinghal, C.E. (Hons.), A.M.I.E., from 31-7-62.

The Circle was employed on both departmental and extra-departmental surveys.

132. **Areas Surveyed.**—

2·8 square kilometres of 1 : 4,000 original ground survey for Kotlibhel Hydel and Irrigation Project.

33·2 square kilometres of 1 : 16,000 original ground survey for Kotlibhel Hydel and Irrigation Project.

44·0 square kilometres of 1 : 16,000 blue-print survey for Kotlibhel Hydel and Irrigation Project.

440·0 square kilometres of 1 : 25,000 air survey of planimetry for Pang Reservoir.

323·8 square kilometres of photo verification on 1 : 25,000 scale for Pang Reservoir.

113·4 square kilometres of ground verification and contouring on 1 : 25,000 blue-prints for Pang Reservoir.

13·5 square kilometres of 1 : 25,000 original ground survey for Kotlibhel Hydel and Irrigation Project.

4·7 square kilometres of 1 : 25,000 original ground survey for Pāndoh Reservoir.

223·0 square kilometres of 1 : 25,000 original ground survey for Māhi Hydel and Irrigation Project.

220·1 square kilometres of 1 : 25,000 revision ground survey for Bombay Guide Map.

65·0 square kilometres of metre-contour survey on 1-inch sheet for reissue.

3,586·0 square kilometres of 2-inch air survey of planimetry.

6,673·0 square kilometres of 2-inch air survey of planimetry from ground verified and contoured photographs.

453·0 square kilometres of photo verification on 2-inch scale for Bhīma Lift Irrigation Project.

2,486·0 square kilometres of photo verification on 2-inch scale for revision survey.

178·0 square kilometres of 1 : 50,000 original ground survey for Landing Charts.

1,437·0 square kilometres of 1 : 50,000 original ground survey on air surveyed blue-prints.

83·0 square kilometres of 1 : 50,000 revision ground survey for Landing Charts.

1,761·2 square kilometres of rapid verification survey on 1 : 50,000 and 1-inch scales for Bhākra Dam Project.

748·0 square kilometres of 1-inch verification survey for Indrāvati and Narmada Projects.

8,451·5 square kilometres of verification of office copy corrections on 1-inch sheets.

3,212·0 square kilometres of 1 : 250,000 verification survey for Approach Charts.

8059·6 square kilometres of $\frac{1}{4}$-inch verification survey for Approach Charts.

1,035·0 square kilometres of triangulation.

3,132·5 square kilometres of triangulation and post-pointing.

31·1 square kilometres of supplementary triangulation.

337·0 square kilometres of supplementary triangulation and post-pointing.

58·6 linear kilometres of theodolite traverse.

55·4 linear kilometres of prismatic compass traverse.

3,359·9 linear kilometres of double tertiary levelling.

309·1 linear kilometres of double tertiary levelling and post-pointing.

17,319·9 linear kilometres of single tertiary levelling.

1,775·0 linear kilometres of single tertiary levelling and post-pointing.

No. 4 PARTY

Officer in charge :— Major P. Rout, B.Sc. (Engg.), Engineers, from 1-4-62 to 24-9-62 and from 10-10-62 to 9-11-62.
Shri K. S. Singh, B.A. (Hons.), from 25-9-62 to 9-10-62 and from 10-11-62.

133. **General.**—During recess the party was engaged on air survey on 2-inch scale and fair mapping on 1 : 50,000 scale of departmental sheets.

During the field season, the party was mainly employed on extra-departmental surveys, required by the Governments of Rājasthān (Māhi Hydel and Irrigation Project in sheet 46 I) and

Uttar Pradesh (Kotlibhel Hydel and Irrigation Project in sheets 53 J, K). In addition, surveys for Approach and Landing Charts of Kānpur, Panna and Satna Aerodromes (I.C.A.O.) and verification survey of office copy corrections on 1-inch sheets in sheet 54 D were also carried out.

The party headquarters remained at Abu (Rājasthān) throughout the period under report.

134. **Personnel.**—The average strength of the party was 1 Class I Officer, 1 Class II Officer and 37 Class III personnel including Clerks.

135. **Areas Surveyed.**—

2·8 square kilometres of 1 : 4,000 original ground survey for Kotlibhel Hydel and Irrigation Project.

32·2 square kilometres of 1 : 16,000 original ground survey for Kotlibhel Hydel and Irrigation Project.

44·0 square kilometres of 1 : 16,000 blue-print survey for Kotlibhel Hydel and Irrigation Project.

13·5 square kilometres of 1 : 25,000 original ground survey for Kotlibhel Hydel and Irrigation Project.

223·0 square kilometres of 1 : 25,000 original ground survey for Māhi Hydel and Irrigation Project.

2,149·0 square kilometres of 2-inch air survey of planimetry.

124·0 square kilometres of 1 : 50,000 original ground survey for Landing Charts.

2,800·0 square kilometres of verification of office copy corrections on 1-inch sheets.

6,029·0 square kilometres of $\frac{1}{4}$-inch verification survey for Approach Charts.

1,035·0 square kilometres of triangulation.

32·0 linear kilometres of theodolite traverse.

873·0 linear kilometres of double tertiary levelling.

136. **Recess Work.**—The party was organised into three sections as follows :—

(*a*) One section under Shri T. R. Viswanathan (Class II), later replaced by Shri R. Sivaramakrishnan (Class II) with 9 Class III personnel carried out the fair mapping of two 1 : 50,000 departmental sheets. Computations of nine 1 : 50,000 sheets were also partly completed under their direct supervision.

(*b*) One section under Shri Gindi Lal, Survey Assistant with 10 other Class III personnel carried out air survey of planimetry on 2-inch scale of three 1 : 50,000 departmental sheets and fair mapping of one 1 : 50,000 departmental sheet.

(*c*) One section under Shri C. S. Ojha, Survey Assistant with 10 other Class III personnel started fair mapping of two 1 : 50,000 departmental sheets. But due to his transfer to Northern Directorate, the personnel of this section were equally divided and attached to the above two sections, so also the alloted task.

137. **Field Work.**—

(*i*) *Original survey and contouring.*—

Camp I.—Shri R. Sivaramakrishnan (Class II), later replaced by Shri S. S. Chabbra (Class II) with headquarters at Srīnagar and with 10 Class III personnel completed 93·5 square kilometres of original survey/blue-print verification and contouring on the ground on 1 : 4,000, 1 : 16,000 and 1 : 25,000 scales for dam site and reservoir areas of Kotlibhel Hydel and Irrigation Project in Garhwāl and Tehri-Garhwāl Districts in sheets 53 J and K.

Camp II.—Shri T. Keshavamoorthy, Surveyor with headquarters at Bānswāra and with 9 other Class III personnel completed 223·0 square kilometres of original survey and contouring on the ground on 1 : 25,000 scale for Māhi Reservoir in Bānswāra and Ratlām Districts in sheet 46 I.

(*ii*) *Triangulation and levelling.*—

(*a*) Shri R. Sivaramakrishnan (Class II) and then under Shri S. S. Chabbra (Class II) with 1 Class II and 3 Class III personnel completed 499·0 square kilometres of triangulation for survey of Kotlibhel Hydel and Irrigation Project in Garhwāl and Tehri-Garhwāl Districts in sheets 53 J and K. In addition, 375·0 linear kilometres of double tertiary levelling was also completed for the same project.

(*b*) Shri T. Keshavamoorthy, Surveyor completed 181·0 square kilometres of triangulation for survey of Māhi Hydel and Irrigation Project in Bānswāra and Ratlām Districts in seeht 46 I. In addition, one Class III Division I and 3 other Class III personnel carried out 417·0 linear kilometres of double tertiary levelling in Bānswāra and Ratlām Districts for the same Project

(*iii*) *Independent detachments.*—

(*a*) Shri C. S. Joshi (Class I) carried out 142·0 square kilometres of triangulation for original 1 : 50,000 scale survey for Satna Aerodrome Landing Chart in Satna District in sheet 63 D. With 1 Class III person, he also carried out 24·0 linear kilometres of theodolite traverse and 30·0 linear kilometres of double tertiary levelling in Panna and Satna Districts.

(*b*) Shri K. K. Tyagi (Class II) carried out 70·0 square kilometres of triangulation in Kānpur District in sheet 63 B for the survey of Landing Chart of Kānpur Aerodrome on 1 : 50,000 scale. He also completed 8·0 linear kilometres of theodolite traverse for the same survey.

(*c*) Shri S. S. Pradhan, Topo Trainee Type 'A' completed 143·0 square kilometres of triangulation for surveying the Landing

Chart of Panna Aerodrome in Panna District in sheet 63 D. He also completed 51·0 linear kilometres of double tertiary levelling.

(*d*) Shri K. R. Chaudhary, Plane-tabler completed 2,800·0 square kilometres of verification of office copy corrections on 1-inch sheets in Guna, Jhālawār and Kota Districts in sheet 54 D.

(*e*) Sarva Shri M. S. Parihar, K. R. Chaudhary and B. L. Dosi, Plane-tablers carried out 124·0 square kilometres of original ground survey on 1 : 50,000 scale for Landing Charts and 6,029·0 square kilometres of verification survey on $\frac{1}{4}$-inch scale for Approach Charts of Kānpur, Panna and Satna Aerodromes in Kānpur, Panna and Satna Districts in sheets 63 B and D.

(*iv*) *Fair mapping.*—A drawing section under Shri R. D. Naithani, Plane-tabler with 7 other Class III personnel was engaged on the fair mapping of five 1 : 50,000 departmental sheets up to end of December 1962.

138. **Technical Methods.**—Most of the area was covered by original survey. Plain areas were contoured by clinopole and level network.

139. **Description of Country.**—The area surveyed and controlled falls into three categories :—

(*a*) High hills with deep gorges.

(*b*) Undulating area with low jungle-clad hills.

(*c*) Built-up areas.

(*a*) *High hills with deep gorges.*—The area falling in sheets 53 J and K where the survey was undertaken was along the banks of rivers Alaknanda, Bhāgīrathi and East and West Nayār for Kotlibhel Hydel and Irrigation Project. The upper reaches of these rivers are covered with pine trees and the rest thickly cultivated. The main crops are paddy, wheat, potatoes and maize. No wild animals seem to exist in the lower reaches of these rivers. Main occupation of people is cultivation and sheep-rearing.

(*b*) *Undulating area with low jungle-clad hills.*—The area falling in sheet 46 I where the survey for Māhi Hydel and Irrigation Project was carried out consists of low hills covered with fairly dense jungle along the banks of Māhi River. Teak, *mahua,* mango and banyan trees are prominent in the area. The area is mostly cultivated and the main crops are maize, cotton and wheat. Wild life is extinct in the area. Main source of water supply is streams and Māhi River. Tape-worm disease is common in the area. Main occupation of people is cultivation and most of them are backward and illiterate.

The area surveyed in 63 D for Panna Aerodrome is thick forest full of wild animals like tiger, bear, *sambar* and *cheetah.* Panna is the nearest town 6 miles west of the aerodrome, Panna is famous for its diamond mines.

(c) *Built-up areas.*—The areas falling in sheets 63 B and D where the aerodrome surveys for Kānpur and Satna were carried out are well built-up. Both are industrial centres.

140. **Miscellaneous.**—

Climate.—It is fairly cold during the winter. Summer is severe in May and June.

Communications.—In parts of sheets 53 J and K communications are poor. In other sheets means of communication are fairly good as vehicles ply throughout the area.

Health.—No disease of any kind was reported.

No. 6 PARTY

Officer in charge :— Shri K. S. Singh, B.A. (Hons.), to 28-11-62.
Shri C. S. Joshi, M.Sc., from 29-11-62 to 22-1-63.
Shri M. N. Kutty, B.A., from 23-1-63.

141. **General.**—The party was employed on departmental survey on 1 : 50,000 scale in Gujarāt for publication on the same scale and on revision survey on 1 : 50,000 scale and verification survey on 1 : 250,000 scale in Gujarāt for Landing and Approach Charts of aerodromes.

In addition, the party was engaged on training of Topo Trainees Type 'B'.

The party headquarters remained at Abu (Rajāsthān) throughout the period under report.

142. **Personnel.**—The average strength of the party was 1 Class I Officer, 1 Class II Officer and 52 Class III personnel including Clerks.

143. **Areas Surveyed.**—

1,437·0 square kilometres of 2-inch original air survey of planimetry.

6,673·0 square kilometres of 2-inch original air survey and contouring from ground verified and contoured photographs.

1,437·0 square kilometres of 1 : 50,000 original ground survey on air surveyed blue-prints.

83·0 square kilometres of 1 : 50,000 revision ground survey for Landing Charts.

2,844·0 square kilometres of verification of office copy corrections on 1-inch sheets.

3,212·0 square kilometres of 1 : 250,000 verification survey for Approach Charts.

144. **Training.**—23 Topo Trainees Type 'B' and 1 Topo Auxiliary were trained in plane-tabling on 1 : 4,000 and 1 : 25,000 scales.

145. **Recess Work.**—The party was organised into three sections as follows :—

(*a*) One section under Shri R. Sivaramakrishnan (Class II), later replaced by Shri T. R. Viswanathan (Class II) with 8 Class III personnel carried out fair mapping of six 1 : 50,000 departmental sheets.

(*b*) One section under Shri R. L. Sharma, Surveyor with 6 other Class III personnel carried out fair mapping of three 1 : 50,000 departmental sheets. It was also engaged in fair mapping of two more 1 : 50,000 departmental sheets.

(*c*) One section under Shri T. Keshavamurthy, Surveyor, later replaced by Shri P. E. Mathew, Surveyor with 15 Class III personnel, carried out air survey of planimetry on 2-inch scale of two 1 : 50,000 sheets. It also completed air survey on the same scale of eighteen 1 : 50,000 sheets.

146. **Field Work.**—During the field season the party was organised as follows :—

(*i*) *Ground verification and contouring.*—

Camp I.—Shri C. Sivaraman (Class II) with 6 Class III personnel completed 1,437·0 square kilometres of ground verification of air surveyed detail and contouring on the ground on 1 : 50,000 scale blue-prints in Junagadh District in sheet 41 K.

(*ii*) *Other surveys.*—Shri C. Sivaraman with 3 Class III personnel also completed :—

(*a*) 83·0 square kilometres of revision survey on 1 : 50,000 scale for Landing Charts and 3,212·0 square kilometres of verification survey on 1 : 250,000 scale on colour prints for Approach Charts of Deesa and Porbandar Aerodromes in Banās Kāntha, Jāmnagar, Junagadh and Mehsāna Districts in sheets 41 G and 45 D.

(*b*) 2,844·0 square kilometres of verification of office copy corrections in Ahmadābād, Kaira and Rājkot Districts in sheets 41 J and 46 B.

(*iii*) *Training.*—

Camp II.—Shri Pritam Singh, Survey Assistant, later replaced by Shri C. Sivaraman with 2 other Class III personnel as Instructors completed the training of 24 Trainees on 1 : 4,000 and 1 : 25,000 scale plane-tabling.

147. **Technical Methods.**—

(*a*) *Ground verification and contouring.*—The original survey on 1 : 50,000 scale was carried out on blue-prints of detail compiled from air photographs. The method is similar to those described in General Report 1961.

(*b*) *Aerodrome Surveys.*—

(*i*) *Landing Charts.*—Blue-prints on 1 : 50,000 scale were obtained by photography from the existing Landing Charts and the revision survey was carried out on these blue-prints by the normal plane-tabling method. 20-metre contours were traced from the existing 1 : 50,000 surveys for Deesa area and verified on the ground. There was no contour in Porbandar Landing Chart area.

(*ii*) *Approach Charts.*—Colour prints (steel grey for details and blue for contours) on 1 : 50,000 scale were obtained by photography from the existing Approach Charts and the verification survey was carried out on these colour prints by the normal plane-tabling methods. 100-metre contours were transferred from the existing 1 : 50,000 surveys and verified on the ground in Deesa area. For Porbandar Aerodrome, 100-metre contours were interpolated on the existing 1-inch maps and transferred to the 1 : 250,000 plane-table section and were then verified on the ground.

148. **Description of Country.**—The area of 1 : 50,000 original survey in sheets 41 K/8, 12 consists of open plains with extensive cultivation and plenty of cart-tracks and two railway lines in the west and middle portions and intricate hills rising up to 500 metres above mean sea-level in the eastern portion. The hills are covered with dense jungle, the Gīr Forest, which is a games sanctuary famous for lions and abounds in bears, *nīlgais* and wild boars.

The Approach Chart survey area of Porbandar is mostly plain adjoining sea on one side and the Bārda Hills on the other. The area is well populated, Porbandar being a port and commercial centre.

The Approach Chart survey area of Deesa is very flat in the west and middle portions with sand dunes and sparse population. In the east portion there are a few rocky hilltops and many cart-tracks and a few big villages. With the construction of many canals of the Banās River Project, most of the fallow lands are being taken up for cultivation.

149. **Miscellaneous.**—The areas surveyed by this unit fall in the erstwhile Saurāshtra State which has a healthy climate especially in the cold season. Rainfall is scanty except in certain districts like Junagadh.

The villages are well served by bus transport which ply even on cart-tracks. Good roads and a network of railway lines make communications easy.

No. 13 PARTY

Officer in charge :— { Shri A. K. Sanyal, B.Sc. (Hons.), to 4-1-63.
Captain, G. M. Kamra, B.Sc. (Civil Engg.), A.M.I.E., Engineers, from 5-1-63.

150. **General.**—The party continued to be employed on levelling in the commanded area of Bhākra Dam Project in the

Punjab. A part of the field potential was also employed on departmental surveys and surveys for Pang Reservoir Project in Punjab and on surveys for Pāndoh Reservoir Project in Himāchal Pradesh.

Recess headquarters of the party remained at Mussoorie (U.P.), field headquarters at Jullundur (Punjab).

151. **Personnel.**—The average strength of the party was 1 Class I Officer, 1 Class II Officer, 3 Class III Division I personnel and 34 other Class III personnel including Clerks.

152. **Areas Surveyed.** —

440·0 square kilometres of 1 : 25,000 air survey of planimetry for Pang Reservoir Project.

323·8 square kilometres of photo verification on 1 : 25,000 scale for Pang Reservoir Project.

113·4 square kilometres of ground verification and contouring on 1 : 25,000 blue-prints for Pang Reservoir Project.

4·7 square kilometres of 1 : 25,000 original ground survey for Pāndoh Reservoir Project.

1,761·2 square kilometres of rapid verification survey on 1 : 50,000 and 1-inch scales for Bhākra Dam Project.

1,108·5 square kilometres of verification of office copy corrections on 1-inch sheets for reissue.

64·8 square kilometres of metre-contour survey on 1-inch sheet for reissue.

31·1 square kilometres of supplementary triangulation for Pāndoh Reservoir Project.

337·0 square kilometres of supplementary triangulation and post-pointing for Pang Reservoir.

539·7 linear kilometres of double tertiary levelling for Bhākra Dam Project.

309·1 linear kilometres of double tertiary levelling and post-pointing for Pang and Pāndoh Reservoirs.

6,648·2 linear kilometres of single tertiary levelling for Bhākra Dam Project.

1,775·0 linear kilometres of single tertiary levelling and post-pointing for Pang Reservoir.

153. **Recess Work.**—During recess the party was organised into three sections, supervised by Sarva Shri A. C. Chawla (Class II), T. K. Maitra and N. K. Saxena as Section Officers.

In all 48 sheets of Bhākra Dam Project covering 2,333·0 square kilometres were mapped and submitted for publication. Besides, 49 sheets of the same project were mapped only partly.

155. **Field Work.**—The field work was organised and completed as under :—

Camp I.—Shri K. L. Chakrabarti, Surveyor (Selection Grade) with 10 other Class III personnel, with camp headquarters first at Nārnaul and later at Kapūrthala, completed 539·7 linear kilometres of double tertiary levelling and 6,648·2 linear kilometres of single tertiary levelling to 25-acre rectangles, in all covering 1,502·0 square kilometres of area for Bhākra Dam Project in Gurgaon, Hoshiārpur, Jullundur, Kapūrthala and Mahendragarh Districts, in sheets 44 M, 44 P, 45 M, 53 D and 54 A. He also completed 1,761·2 square kilometres of rapid verification (for major detail only) on 1-inch and 1 : 50,000 scales in sheets 44 M/3, 4, 7, 10, 11, P/16, 45 M/13, 53 D/4, 8, 12 and 54 A/1 for the above project in Gurgaon, Jullundur, Kapūrthala and Mahendragarh Districts of the Punjab.

In addition to the above, verification of office copy corrections on 1-inch sheets 53 D/5, 12 covering an area of 1,108·5 square kilometres in Gurgaon, Hissār, Mahendragarh and Rohtak Districts of the Punjab and survey of metre-contours on 1-inch scale for 64·8 square kilometres in sheet 53 D/15 in Gurgaon District of the same state was also completed.

Camp II.—Shri T. K. Maitra and later after two months Shri N. K. Saxena with 8 other Class III personnel, with camp headquarters first at Talwāra Dam site for 3 weeks only and later at Mangwāl, completed 259·0 square kilometres of supplementary triangulation and post-pointing, 145·0 linear kilometres of double tertiary levelling and post-pointing and 25·0 linear kilometres of single tertiary levelling with post-pointing besides 323·8 square kilometres of photo verification on 1 : 25,000 scale in sheets 43 P/16, 44 M/13 and 52 D/4 for Pang Reservoir in Kāngra District of the Punjab.

In addition to the above, 440·0 square kilometres of air survey on 1 : 25,000 scale was also done for the same project in the same area.

Camp III.—Shri N. K. Saxena with of 8 other Class III personnel, with camp headquarters first at Pāndoh and later at Mangwāl and Talwāra Dam site, completed 31·1 square kilometres of supplementary triangulation, 24·1 linear kilometres of double tertiary levelling and 4·7 square kilometres of original ground survey on 1 : 25,000 scale in sheet 53 E/2 for Pāndoh Reservoir in Mandi District of Himāchal Pradesh. He also completed 78·0 square kilometres of supplementary triangulation and post-pointing, 140·0 linear kilometres of double tertiary levelling and post-pointing, 1,750·0 linear kilometres of single tertiary levelling and post-pointing for 1 : 25,000 scale survey in sheets 43 P/16 ; 44 M/13 ; 52 D/4 and 53 A/1 for Pang Reservoir in Kāngra District of Punjab.

In addition to the above, 113·0 square kilometres of ground verification and contouring on 1 : 25,000 scale blue-prints in the

above area of Pang Reservoir Project in Kāngra District of Punjab were also done by this camp.

Drawing Section.—Shri S. D. P. Jakhmola, Surveyor with an average of 2 other Class III personnel completed fair mapping of 30 sheets of Bhākra Dam Project covering an area of 1,458·0 square kilometres.

155. Technical Methods.—

(*a*) *Bhākra Dam Project.*—For levelling and rapid verification, refer to General Report 1962.

(*b*) *Office copy verification.*—Verification was done on the published 1-inch sheets as field P.T. Sections. Reliable existing main details and at places the rectangulation stones of Bhākra Project were used.

(*c*) *Survey of metre-contours.*—Same method as for the verification of office copy corrections was used. Spirit-levelled heights of Bhākra stones were used for want of sufficient spot-heights on the map for the area.

(*d*) *Pāndoh Reservoir Project.*—The planimetric and height control was provided by supplementary triangulation and spirit-levelling, respectively. Normal plane-tabling methods were followed for survey of detail on 1 : 25,000 scale and contours at 5 metres interval.

(*e*) *Pang Reservoir Project.*—The specifications were : ground survey on 1 : 25,000 scale with V.I. at 5 metres and 2·5 metres for hills and plains, respectively.

For combination, triangulation was resorted to and control post-pointed. Islands in the river were surveyed for 2·5 metres contours on the ground. The area between the river and the steep hills was completed by air survey from verified photographs and contours were interpolated on the photographs from the post-pointed network of spirit-levelled spot-heights. The hills on the flanks were surveyed by plane-tabling on the blue-prints obtained from air survey sections.

156. Description of Country.—The area can be described as of four types as under :—

(*a*) *Nārnaul area* consists of extensively cultivated sandy plains interspersed here and there with sharp-peaked barren hillocks of the Arāvalli Range. The southern part is slightly undulating with incidence of deep narrow streams and ravines.

The cultivation is by well-irrigation. The area is well-populated, camel being the principal mode of transport. The road construction programme is, however, well apace. The area is buzzing with activity and prosperity seems to be seeping into it from the adjoining rich state of Delhi. There are a number of ruined monuments and structures of Saracenic style of the Moghul era in and near Nārnaul.

(*b*) *Jullundur–Kapūrthala area* consists of very extensively cultivated flat plains irrigated both by canals and electrically operated tube wells. It is thickly populated and extensively criss-crossed by rail and metal roads. Though slightly backward, Kapūrthala, an erstwhile princely state, is now fast catching up with its neighbouring district, Jullundur. The din of activity, and the dust of the rolling pneumatic wheels mingled with the rumble of rail-roads over the area make one aware of being caught up in the hub of the state of Punjab's motion towards industrialisation.

(*c*) *Dera–Gopipura area* lies in the last valley of Beās River from whence it leaves the mountains and outfalls into the plains. In the south it is enclosed by Siwālik Hills of Hoshiārpur District with deep narrow gorges and ravines. In the north-east it is overlooked by the suddenly rising high hills of the great Himālayan Ranges with picturesque snow-covered ridges. It is thinly populated and moderately cultivated. The valley is traversed through by a narrow-gauge railway running from Pathānkot to Joginder Nagar and is approachable by metalled roads from the north-west and the south. River Beās in this valley is fed by numerous wide and shallow streams liable to sudden flooding during rains. These streams are locally known as 'Khads'. As one enters the valley, one is struck by its beauty and now no less by its gloom foreshadowing the migration of its population, once the area gets submerged under the water impounded by the Beās Dam.

(*d*) *Mandi area* lies at an average altitude of about 3,000 feet where Beās River passes through a deep narrow gorge. The area is rocky with steep hills covered with thick pine forest on both sides of river Beās. It is thinly populated and has little cultivation. The means of communication are scanty. The area is approachable by a metalled road running from Pathānkot to Kulu.

No. 31 PARTY

Officer in charge :—Shri G. S. Oberoi, M.A.

157. **General.**—The party was employed on the fair mapping of sheets of 'Reclamation of the Little Rann of Kutch' Project and Ghed Project for the Government of Gujarāt, and of Forest Sheets required by the Conservator of Forests, Junagadh Circle, Junagadh and was also employed on surveys of Bhīma Lift Irrigation, Morna and Gyānganga Projects for the Government of Mahārāshtra.

The party headquarters remained at Poona (Mahārāshtra) throughout the period under report.

158. **Personnel.**—The average strength of the party was 2 Class I Officers, 1 Class II Officer and 36 Class III personnel including Clerks.

159. **Areas Surveyed.**—

453·0 square kilometres of photo verification on 2-inch scale for Bhīma Lift Irrigation Project.

1,120·0 square kilometres of triangulation and post-pointing for Bhīma Lift Irrigation Project.

758·0 linear kilometres of double tertiary levelling for Bhīma, Morna and Gyānganga Projects.

1,652·0 linear kilometres of single tertiary levelling for Bhīma Project.

160. Recess Work.—During recess the party was organised into three sections as follows :—

(*a*) One drawing section under Shri C. S. Joshi (Class I), with 11 Class III personnel, was engaged in the fair mapping of 15 sheets of 'Reclamation of the Little Rann of Kutch' Project.

(*b*) One section under Shri N. Kothandaraman, Surveyor with 10 other Class III personnel, was engaged in the fair mapping of 18 Forest Sheets.

(*c*) One computing section under Shri C. S. Joshi with 4 Computers completed the computations of triangulation in sheet 47 F/14 and of levelling done for 'Reclamation of the Little Rann of Kutch'.

161. Field Work.—During the field season the party was organised as follows :—

(*a*) *Camp I.*—Shri Jagan Nath (Class II) with 12 Class III personnel completed 453·0 square kilometres of photo verification on 2-inch scale, 1,120·0 square kilometres of triangulation and post-pointing, 577·0 linear kilometres of double tertiary levelling and 1,652·0 linear kilometres of single tertiary levelling for Bhīma Lift Irrigation Project in Sholāpur District in sheets 47 N/4, 8, O/1, 5, 6, 9 and 10. He also completed 83·0 linear kilometres of double tertiary levelling for Morna Project in Akola District and 98·0 linear kilometres of double tertiary levelling for Gyānganga Project in Buldāna District.

(*b*) *Headquarters Section.*—A section under Shri Mohan Ram, Surveyor with 9 Draftsmen and 1 Computer completed fair mapping of 22 sheets of 'Reclamation of the Little Rann of Kutch' Project in sheets 41 I and M.

162. Technical Methods.—

(*a*) *Survey of Bhīma Lift Irrigation Project.*—The indentor's requirements are contoured maps of the area on 1 : 15,000 scale with contours at a vertical interval of 2·5 metres. To meet this demand (i) verification of detail was carried out on the ground on 2-inch air photographs, (ii) planimetric control was provided by triangulation for the purpose of air survey of planimetry and (iii) level lines, double and single tertiary, were run in the entire area, at intervals of about 30 chains, the interspace being covered by abreast heights. Normal departmental methods were used. The contours are to be interpolated on the photographs under stereo fusion, with the help of spirit-levelled spot-heights.

(*b*) *Fair mapping of sheets of 'Reclamation of the Little Rann of Kutch' Project.*—Black prints on 4-inch scale were obtained from the 2-inch plane-table sections which were on spherical projection. Mosaics were prepared on grid layout, size of each sheet being 15,000 grid yards by 10,000 grid yards. All the spirit-levelled heights were entered on these mosaics and contouring (at 2 feet V.I. in plains and 10 feet V.I. in bets) completed on them. Drawing blue-prints were subsequently obtained on 4-inch scale.

Only one original was fair drawn for details, contours and names ; where contours were heavy, a separate contour original was also drawn. A yellow guide for cultivated areas was also prepared.

A mock-up for the border, north and south marginal items etc., was prepared and the plate for the same was kept standing in the printing office. Corrections for each sheet were intimated to the printing office in the *Publication Instructions* for necessary action while printing the sheet. Maps would be printed in three colours – black, brown and yellow.

163. **Description of Country.**—The project area is in the form of a belt about 4 to 10 miles wide and about 50 miles long, situated astride the north bank of Bhīma River flowing north-west to south-east.

The country is flat with gentle slopes. The surface rolls in long low uplands separated by hollows, with an occasional level. A number of terraces are also seen in the area with sharp falls varying from 2 to 6 metres. The cultivable soil generally extends to a depth of a metre or two, beneath which the ground comprises of hard rock, difficult to break or penetrate. Digging wells and getting access to subsoil water is, consequently, a very laborious and strenuous process. Tubewells have been bored at places, surrounded by small fruit gardens. Wells are spotted easily on the ground because of fairly prominent mounds of dug-out rocky soil heaped beside them. These wells are fairly wide and mostly have rock-cut stairs to approach the surface of water, which is generally sweet and appetising. The soil, nevertheless, is fertile and yields good harvests, if rain is timely and adequate. The thin surface layer of soil is preserved carefully by numerous bunds built around the fields. The staple food is *jowār*, the other crops grown being *bājra*, wheat, variety of pulses, oilseeds and cotton. No sugarcane is seen in this area, though there is plenty of it accross the river on its southern side, where the area is canalised.

The river Bhīma is shallow and broad with high rocky banks. The southern bank is generally more precipitous than the northern. Water melons and fruits of that variety and vegetables are grown in the dry sandy beds of the river in the summer months.

The wild life consists of jackal, grey fox, antelope, hare, etc. The common game birds seen are *kalam*, black and grey partridges, quail and snipe. Among river fish, *maral* is the most common.

Babūl, nīm and *pīpal* are the only timber trees found, besides several species of acacia and other flowering plants.

The area is fairly well populated. People are co-operative and progressive in their outlook. They live mostly in tile-roofed huts and seem to be fairly prosperous. Local labour is available at Rs. 1·50 to 2·50 per day.

164. Miscellaneous.—

Climate.—The climate in the area surveyed is healthy and agreeable, except from March to May when it is very hot and oppressive in the day-time, but cool at night. During winter, from November to February, the weather is clear and bracing.

Communications.—With a village every three to four miles apart, communications and postal facilities are fairly good in the area. Bullock carts are quite common. The national highway from Bombay to Hyderābād touches the area in the north. A narrow gauge railway line connecting Kurduvādi and Miraj passes through the area. There is a motorable road between Tembhurni in the north and Pandharpur in the south. Pandharpur is a well-known pilgrim centre. In addition, almost all cart-tracks are motorable in dry season. There are ferries every 3 to 4 miles along the river, which are managed by country boats ; there is no arrangement, however, for the motor transport to be ferried across. They can only cross the river by bridges near Tembhurni or Pandharpur. The river becomes fordable at places, in summer months.

Health.—Health of the personnel remained generally satisfactory. Precautions against local epidemics like cholera, small-pox, etc., were promptly taken by all field hands.

No. 32 PARTY

Officer in charge :— Lt.-Colonel D. N. Sharma Atri Harnal, Engineers, to 18–6–62.
Shri K. S. Singh, B.A. (Hons.), from 19–6–62 to 18–9–62.
Shri V. P. Sharma, B.A., from 19–9–62.

165. General.—The party was employed on the following works :—

(*a*) Survey for preparation of Approach and Landing Charts of Akola Aerodrome to I.C.A.O. specifications in sheets 55 D/13, 14 and H/1, 2, 3, 5, 6, 7.

(*b*) Surveys for Narmada Commanded Area in sheets 46 A/12, 16, B/16, C/9, 10, 13, 14, E/4, F/1, 5, 6, 7, 11, 12 and G/1, 2, 13.

(*c*) Survey for Indrāvati Project in sheets 65 E/7, 8, 11, 12, 15, 16, and 65 I/4.

(*d*) Revision survey for Bombay Guide Map in sheets 47 A/16 and B/13.

(*e*) Verification of office copy corrections in sheets 47 A/16, 55 D/13, 14 and 55 H/1, 2, 3, 5, 6, 7.

(*f*) Triangulation and post-pointing on 1 : 25,000 scale air photographs for 1 : 25,000 scale departmental surveys and Akola Aerodrome in sheets 41 L/13, 14, P/1, 2, 46 D/14, 15, 16, H/3, 4, 7, 8 and 55 H/2.

The headquarters of the party remained at Abu (Rājasthān) throughout the period under report.

166. **Personnel.**—The average strength of the party was 1 Class I Officer, 1 Class II Officer and 49 Class III personnel including Clerks.

167. **Areas Surveyed.**—

220·1 square kilometres of 1 : 25,000 revision ground survey for Bombay Guide Map.

2,485·4 square kilometres of photo verification on 2-inch scale.

54·4 square kilometres of 1 : 50,000 original ground survey for Landing Chart of Akola Aerodrome.

748·0 square kilometres of 1-inch verification survey for Indrāvati and Narmada Projects.

1,699·0 square kilometres of verification of office copy corrections on 1-inch sheets.

2,030·6 square kilometres of $\frac{1}{4}$-inch verification survey of communications and office copy corrections for Approach Chart of Akola Aerodrome.

2,012·5 square kilometres of triangulation and post-pointing on 1 : 25,000 air photographs.

27·0 linear kilometres of theodolite traverse.

55·0 linear kilometres of prismatic compass traverse.

1,189·2 linear kilometres of double tertiary levelling.

9,019·9 linear kilometres of single tertiary levelling.

168. **Recess Work.**—Recess work was organised as follows :—

Section I.—Shri P. Ramamoorthy (Class II) with 12 Class III personnel carried out the computations of heights and air survey of planimetry of thirteen 2-inch sheets for Ghed Flood Control and Reclamation Project.

Section II.—Shri Mohan Ram and Shri P. E. Mathew, Surveyors with 12 other Class III personnel carried out the computations of heights and air survey of planimetry of twelve 2-inch sheets for Ghed Flood Control and Reclamation Project.

169. **Field Work.**—The field work was organised as under :—

(1) Shri P. Ramamoorthy (Class II) with 20 Class III personnel carried out 1,856·8 square kilometres of photo verification on 2-inch scale, 738·0 square kilometres of 1-inch verification survey

and 7,291·6 linear kilometres of single tertiary and 726·8 linear kilometres of double tertiary levelling for the 4-inch survey of Narmada Commanded Area in sheets 46 A/12, 16, B/16, C/9, 10,13, 14, E/4, F/1, 5, 6, 7, 11, 12 and G/1, 2, 13.

(2) Shri R. L. Sharma, Surveyor with 8 other Class III personnel carried out 628·6 square kilometres of photo verification on 2-inch scale, 10·0 square kilometres of 1-inch verification survey, 26·6 linear kilometres of theodolite traverse, 55·4 linear kilometres of compass traverse, 1,717·0 linear kilometres of single tertiary and 462·4 linear kilometres of double tertiary levelling for Indrāvati Project in sheets 65 E/7, 8, 11, 12, 15, 16 and 65 I/4.

(3) *Independent Detachments.*—

(*a*) Shri P. E. Mathew, Surveyor with 1 Plane-tabler completed 199·5 square kilometres of triangulation for departmental surveys in Diu and Akola Aerodrome, 54·4 square kilometres of 1 : 50,000 original ground survey for Akola Aerodrome Landing Chart, 2,030·6 square kilometres of ¼-inch verification survey for the Approach Chart, 1,417·0 square kilometres of 1-inch verification of office copy corrections and 11·3 linear kilometres of single tertiary levelling for Akola Aerodrome in sheets 41, L/13, 14, P/1, 2, 55 D/13, 14, H/1, 2, 3, 5, 6 and 7.

(*b*) Shri S. B. L. Sharma, Surveyor completed 1,813·0 square kilometres of triangulation and post-pointing of plan control on 1 : 25,000 air photographs for 1 : 25,000 departmental survey in sheets 46 D/14, 15, 16, H/3, 4, 7, 8 and 55 H/2.

(*c*) Two Plane-tablers completed 220·1 square kilometres of 1 : 25,000 revision survey for Bombay Guide Map and 282·0 square kilometres of 1-inch verification of office copy corrections in sheets 47 A/16 and B/13.

179. **Technical Methods.**—For the aerodrome survey, the Landing Chart was surveyed by normal plane-tabling methods on a blank plane-table section, to metric specifications.

The verification survey were carried out on 1-inch and ¼-inch mounted maps. Normal plane-tabling methods were used. The 100-metre contours were interpolated with the help of existing foot-contours and verified on the ground for the Akola Aerodrome Approach Chart. For the Narmada Commanded Area, refer to para 104 of General Report 1961.

For the Indrāvati Project area, methods similar to the Narmada Commanded Area were adopted.

For Bombay Guide Map, black prints on 1 : 25,000 scale were obtained by photography from the air survey of planimetry on the same scale. The final surveys were carried out on these black prints by normal plane-tabling methods.

171. **Description of Country.**—The Narmada Commanded Area consists of open cultivated plains cut by numerous streams.

The area is densely populated and well connected by a network of roads and railways. Cotton is cultivated extensively in the area. Area falling in Broach District abuts the sea shore and is cut by tidal streams. Parts of the area are dotted with numerous oil wells.

The Indrāvati Project area is mostly open undulating ground with occasional patches of jungle. The area is well populated and paddy is grown along stream banks. Sugar-cane is also grown in the area. The area abounds in mango groves. Tamarind, *nīm* and *pīpal* trees are found in abundance near villages and *sāl* trees in the jungles. The wooded areas are in habited by wild animals like the tiger, panther, bear, etc. The area has scanty means of communication and country carts ply only during the dry season.

The country around Akola is mostly open cultivated plains, generally well populated. The area is well connected by roads and a railway line runs through the area.

The country around Diu abuts the sea shore and is mostly of marsh and salt-waste, dotted with sand dunes and patches of cultivation. The Diu Island is a well developed area with numerous palm and coconut groves. Varieties of sea birds thrive along the coastal belts.

The country around Damān is open and forest-clad hills with patches of cultivation. The area is connected by roads. Labour is scarce in the area and has to be imported from out side.

172. Miscellaneous.—The health of the personnel was satisfactory till end of March ; thereafter there were cases of sickness due to summer.

VIII. SURVEY REPORTS, TRAINING DIRECTORATE

DIRECTOR :— Colonel J. A. F. Dalal, B.A. (Hons.), p.s.c., M.I.S., to 20-5-62 and again from 6-8-62.
Colonel R. S. Kalha, M.I.S., from 21-5-62 to 5-8-62.

173. **Summary.**—The units administered by this Directorate were Nos. 10 (from 15-11-62), 11 (up to 31-5-62), 13 (from 1-4-62 to 15-10-62), 15, 16, 34 (from 15-11-62), and 36 (from 7-1-63) Parties. Work of Nos. 10, 15, 16, 34 and 36 training parties is described in this Directorate's report, that of No. 11 Party appears under Eastern Circle's report and that of No. 13 Party appears under Western Circle's report.

The headquarters of the Directorate were shifted from Dehra Dūn (U.P.) to Hyderābād (Andhra Pradesh) with effect from the 15th November 1962.

174. **Areas Surveyed.**—

662·0 square kilometres of triangulation.
52·5 square kilometres of blue-print revision survey on 8-inch scale.

No. 10 (TRAINING) PARTY

Officer in charge :— Shri R. S. Chugh, M.A., A.M.I.S., to 24-4-62 and again from 4-6-62.
Shri Muneendra Kumar, M.Sc., from 25-4-62 to 3-6-62.

175. **General.**—This party continued to function as a training party for Topo Trainees Type 'B', Class III Division II Service.

The headquarters of the party remained at Bangalore (Mysore) throughout the period uner report.

176. **Personnel.**—The average strength of the instructional staff was 1 Class I Officer, 3 Survey Assistants and 6 other Class III personnel.

178. **Training.**—

(*a*) *1960-62 Course.*—23 trainees completed the course and were posted out. One was discharged.

(*b*) *1962-63 Course.—First Batch.*—Out of 12 trainees, who joined on various dates between July 1961 and February 1962, 7 completed their training during the period under report and were posted out; one resigned in February 1962 and 4 resigned during the period under report.

Second Batch.—Out of 52 trainees 47 continued their training, 2 resigned and 3 were transferred out on their appointment as Topo Trainees Type 'A', Class III Division I Service.

Third Batch.—Out of 7 trainees 6 continued their training and one was transferred out on his appointment as Topo Trainee Type 'A' Class III Division I Service.

Fourth Batch.—10 trainees continued their training.

178. **Recess Work.**—Trainees of 1960–62 Course were given a short course of air survey training in chalking of details and contouring on air photographs and completion of an air survey section and were posted out to other units at the end of June 1962.

Trainees of the first batch of 1962–63 Course completed a course in air survey.

Trainees of the second batch of 1962–63 Course were given practice in drawing and preliminary training in air survey.

Trainees of the third batch of 1962–63 Course were given practice in fair mapping.

Trainees of the fourth batch 1962-63 course were given brief practice in fair mapping.

179. **Field Work.**—Training of various batches of 1962–63 Course in field work was organised as follows :—

First Batch.—Training in plane-tabling on 1 : 25,000 scale in Tondebhāvi area under Shri C. M. Azimuddin, Survey Assistant (Selection Grade) assisted by one instructor.

Training in plane-tabling on 1 : 50,000 scale in Nandi Hills area under Shri C. S. Ananthan Nair, Survey Assistant (Selection Grade) and later under Shri D. J. David.

Training in post-pointing and photo verification in Nandi Hills area under Shri D. J. David.

The seven trainees of this batch who completed the training were posted away to other units in February 1963.

Second Batch.—Training in plane-tabling on 1 : 1,000 scale in Bangalore in the camp of Shri C. M. Azimuddin, assisted by seven instructors.

Training in plane-tabling on 1 : 25,000 and 1 : 50,000 scales in Nandi Hills area under two Camp Officers, Sarva Shri C. S. Ananthan Nair, Survey Assistant (Selection Grade) and Mohd. Habibullah, Survey Assistant, each assisted by two instructors.

Third batch.—Training in plane-tabling on 1 : 1,000 scale in Bangalore under Shri C. M. Azimuddin.

Training in plane-tabling on 1 : 25,000 and 1 : 50,000 scales in Nandi Hills area in the camp of Shri C. S. Ananthan Nair, under one instructor.

Fourth batch.—Training in plane-tabling on 1 : 1,000 scale in Bangalore under Shri C. M. Azimuddin.

Training in plane-tabling on 1 : 25,000 scale in Nandi Hills area under Shri C. M. Azimuddin, assisted by one instructor.

180. **Description of Country.**—The training area around Nandi Hills lies 55 kilometres North of Bangalore in Bangalore and Kolār Districts of Mysore State. The country consists of medium high and low hills and open and undulating cultivated valleys. The hills are covered by light vegetation and scrub and have a number of mountain features on their slopes. The metalled road from Bangalore to Nandi Drug and a narrow gauge railway line run through the area.

The training area around Thondebhāvi lies 60 kilometres North of Bangalore, in Kolār District of Mysore State. The country consists of medium high and low hills and open undulating cultivated valleys. The hills are covered by light vegetation and scrub. The metalled road and the metre-gauge railway line from Bangalore to Guntakal run through the area.

181. **Miscellaneous.**—Health of the personnel was generally satisfactory. One contingent *khalāsi* died of heart attack.

No. 15 (TRAINING) PARTY

Officer in charge :—{ Major D. P. Hajela, B.Sc., B.E. (Civil), Engineers, to 19-8-62.
Major J. P. G. King, B.Sc., B.T., Engineers, from 20-8-62.

182. **General.**—The party continued to be employed on training the officers of the department of and above the grade of Topo Trainees Type 'A', Class III Division I on their first appointment. Control work required for the various training areas around Hyderābād was also taken up.

The headquarters of the party remained at Dehra Dūn (U.P.) throughout the period under report.

183. **Personnel.**—The average strength of the instructional staff was 1 Class I Officer, 6 Class II Officers and 7 Class III Division I Officers.

184. **Training.**—The following courses of instruction were run during the period :—

(*a*) *1960-62 Course.*—

4 Class I Officers and
1 Class III Officer (T.T.T. 'A'),

completed their training and were relieved for posting to other units.

(*b*) *1961-62 Course.*—

1 Class II Officer and
7 Class III Officers (T.Ts.T. 'A'),

completed their training and were relieved for posting to other units.

(*c*) *1961–63 Course.*—

4 Class I Officers.

continued their training.

(*d*) *1962–63 Course.*—

10 Class II Officers and
83 Class III Officers (T.Ts.T. 'A'),

commenced their training as and when they reported to the party.

(*e*) *1962–63 Course—22 Weeks' Course for Photogrammetric Operators.*—19 Class III Officers (T.Ts.T. 'A', Photogrammetric Operators), completed their training and were posted out and one submitted his resignation.

(*f*) *Special Course for Extra-departmental Officers.*—

1 Officer from the State of Madhya Pradesh completed his course of training.

1 Officer from the Public Works Department, Gujarāt reported for a comprehensive training course (44 weeks) in December 1962.

3 Officers from the Geological Survey of India reported for a comprehensive training course (19 weeks) in January 1963.

185. **Areas Surveyed.**—

6·7 square kilometres of triangulation for 1 : 4,000 scale survey in training area.

137·3 square kilometres of triangulation for 1 : 25,000 scale survey in training area.

518·0 square kilometres of triangulation for 1 : 50,000 scale survey in training area.

186. **Recess Work.**—(*a*) During recess work the trainees were given theoretical instructions in survey subjects and practical training in air survey and fair mapping.

On completion of their training 4 Class I Officers of the 1960–62 Course and 1 Class II Officer of the 1961–62 Course appeared for the Intermediate Examination of the Institution of Surveyors at the end of September 1962 and qualified in this examination.

(*b*) Shri G. N. Dubey (Class II) assisted by Shri R. K. Lal, Survey Assistant (Selection Grade) gave training to 30 Class III (T.Ts.T. 'A') in pre-field work, viz., fair mapping and fusion practice, use and adjustments of survey instruments, and projection and plotting prior to their transfer to No. 36 Party for training.

187. **Field Work.**—The field work was organised as follows:—

Camp (I).—Shri Mastan Singh (Class II) completed 6·7 square kilometres of triangulation for 1 : 4,000, 137·3 square kilometres for 1 : 25,000 and 518·0 square kilometres for 1 : 50,000 scale surveys in training areas in Hyderābād and Nalgonda Districts of Andhra Pradesh.

Camp (II).—Shri Y. D. Hegde (Class II) assisted by Shri S. P. Gupta (Class II), Sarva Shri E. G. Warier, and K. L. Chakrabarti, Surveyors (Selection Grade), M. L. Sahdev and N. B. Choudhury, Surveyors and Sarva Shri Bakhtawar Singh and N. V. Nair, Survey Assistants, imparted the following training from Sahasradhāra Camp:—

The trainees of 1961–63 Course received training in triangulation, Hunter Short Base traverse, plane-tabling on 1 : 50,000 scale, photo verification, blue-print verification and height control, revision of maps by ground methods, barometric levelling, rectangulation and field astronomy. They also carried out, individually, a Survey Scheme of one week's duration.

6 Class II Officers and 8 Class III Officers (T.Ts.T. 'A') of the 1962–63 Course received training in tertiary levelling, theodolite traverse, Hunter Short Base traverse, photo verification, blue-print verification and height control, revision of maps by ground methods, plane-tabling on 1 : 4,000 scale and astronomical observations.

1 Class II Officer and 14 Class III Officers (T.Ts.T. 'A') of the 1962–63 Course received training in theodolite traverse, photo verification, blue-print verification and height control, revision of maps by ground method and plane-tabling on 1 : 4,000 scale. Out of these 14 Class III Officers (T.Ts.T. 'A'), 8 received training in tertiary levelling in addition.

1 Class II Officer and 6 Class III Officers (T.Ts.T. 'A') of the 1962–63 Course received training in tertiary levelling, theodolite traverse and plane-tabling on 1 : 4,000 scale. One of the T.Ts.T. 'A' resigned during the training.

20 Class III Officers (T.Ts.T. 'A', Photogrammetric Operators) of the 1962–63 (22 weeks) Course received training in plane-tabling on 1 : 4,000 and 1 : 50,000 scales, theodolite traverse, triangulation, tertiary levelling, photo verification, blue-print verification and height control. One of them submitted his resignation after completion of his training.

The trainee from Madhya Pradesh received training in 1 : 25,000 scale plane-tabling, photo verification, revision of maps, rectangulation and height control.

The trainee from the State of Gujarāt received training in plane-tabling on 1 : 1,000, 1 : 4,000 and 1 : 25,000 scales, theodolite traverse, tertiary levelling, triangulation, photo verification and rectangulation.

The trainees from the Geological Survey of India received training in plane-tabling on 1 : 1,000, 1 : 4,000 and 1 : 25,000 scales, tertiary levelling, theodolite traverse, tacheometry and barometric levelling.

Camp (III).—Shri K. N. S. K. Pillai (Class II) assisted by Shri Ishar Singh, Surveyor, Shri Sohan Singh, Survey Assistant (Selection Grade), Shri R. K. Lal, Survey Assistant (Selection Grade), and Shri Puran Chand, Survey Assistant, imparted the following training from Maldeota Camp :—

2 Class II Officers and 18 Class III Officers (T.Ts.T. 'A') of the 1962–63 Course received training in tertiary levelling, theodolite traverse, Hunter Short Base traverse, photo verification, blue-print verification and height control, revision of maps by ground methods, plane-tabling on 1 : 4,000 and 1: 50,000 scales and astronomical observations. They also individually carried out a Survey Scheme of one week's duration.

6 Class III Officers (T.Ts.T. 'A') of the 1962–63 Course received training in tertiary levelling, theodolite traverse, photo verification, blue-print verification and height control, revision of maps by ground methods, plane-tabling on 1 : 4,000 scale and astronomical observations.

188. **Technical Methods.**—Normal departmental methods and procedures were used for the triangulation executed.

189. **Description of Country.**—The training areas around Sahasradhāra and Maldeota consist of hills and undulating plains with light vegetation. The hilly area is scrub covered.

The training areas around Hyderābād are undulating plains, interspersed with low hills covered with rock outcrops.

190. **Miscellaneous.**—Health of the personnel remained satisfactory throughout.

No. 16 (TRAINING) PARTY

Officer in charge :—Shri N. N. Dhawan, B.A.

191. **General.**—The headquarters of the party remained at Dehra Dūn (U.P.) throughout period under report.

The party continued to function as a training unit for Topo Trainees 'B', Class III Division II Service.

192. **Personnel.**—The average strength of the instructional staff was 1 Class I Officer, 1 Class II Officer and 11 Survey Assistants.

193. **Training.**—2 Topo Trainees Type 'B' who got detained from the previous years' course due to sickness completed their training and were posted out. 56 trainees completed their training of one year and were posted out.

Another lot of 11 trainees failed to make the grade and were posted out as Recordkeepers.

2 Nepālese trainees completed their course of training (identical with that for departmental Topo Trainees Type 'B') under the Colombo Plan and returned back to their country.

32 newly recruited Topo Trainees Type 'B' (Stereo Operators) joined the unit during the period under report and completed a compressed course in plane-tabling and air survey and were posted out.

80 newly recruited trainees continued their training.

194. **Areas Surveyed.**—

52·5 square kilometres of blue-print revision survey on 8-inch scale.

195. **Recess Work.**—The training was organised under Shri G. N. Dubey (Class II) assisted by 9 Survey Assistants. The 1961–62 batch completed their training in air survey. The new batches of trainees were given preliminary training in draftsmanship course of 4 weeks' duration.

196. **Field work.**—The field work was initially organised under Shri G. N. Dubey (Class II), assisted by 11 Survey Assistants till the former's transfer out of the unit in January 1963, when the Survey Assistants assumed the supervisory duties in addition to their instructional duties. The trainees completed their training in plane-tabling on 1 : 1,000, 1 : 25,000 and 1 : 50,000 scales. 39 trainees under Sarva Shri Udai Singh and R. P. Kukreti, Survey Assistants (Selection Grade) and Sarva Shri Jogindar Singh, Baldev Singh and Harnam Singh, Survey Assistants completed 52·5 square kilometres of blue-print revision survey on 8-inch scale, with 20 metres contour interval of Mussoorie Guide Map as a part of their training programme.

197. **Technical Methods.**—The survey was carried out on zinc-mounted blue-prints of the existing Mussoorie Guide Map on 8-inch scale for publication on 1 : 10,000 scale. All stations and intersected points falling in the area were plotted from the triangulation data used by training parties for training. The existing details were corrected where necessary. A contour interval of 20 metres was adopted in place of 100 feet in the existing guide map. Normal plane-tabling methods were adopted for surveying.

198. **Description of Country.**—Plane-tabling on 1 : 1,000 scale was carried out in a fairly open area with scattered buildings. The country covered by 1 : 25,000 survey consisted of river valley terraces flanked by rising hills partly bare and partly covered with fairly dense vegetation. The country surveyed on 1 : 50,000 scale comprised high bare hills sloping down to steep narrow valleys.

The Mussoorie Guide Map area was covered with fairly dense jungle of pine trees with Mussoorie Town occupying the main ridges.

199. **Miscellaneous.**—Health of the personnel remained generally satisfactory.

No. 34 (TRAINING) PARTY

Officer in charge :—Shri J. Narasimhan, B.Sc. (Hons.), from 16-8-62 to 2-12-62.
Shri R. S. Chugh, M.A., A.M.I.S., from 3-12-62 to 27-12-62.
Major G. Shreeniwas, B.Sc., A.M.I.E., Engineers, from 28-12-62.

200. **General.**—This party was raised under Southern Circle on 16-8-62 and was transferred to the administrative control of the Director, Training Directorate with effect from 15th November 1962.

The party was engaged in training Topo Trainees Type 'B' (Class III Division II Service).

The headquarters of the party remained at Bangalore (Mysore) throughout the period under report.

201. **Personnel.**—The average strength of the instructional staff was 1 Class I Officer, 1 Survey Assistant and 5 Class III Division II personnel.

202. **Training.**—The following courses were run during the period under report :—

(*a*) *1962-63 Course* (*4 months*).—

9 T.Ts.T. 'B' (Stereo Operators) completed their training and were posted out.

(*b*) *1962-63 Course* (*1 year*).—

First Batch—5 trainees continued their training.

Second Batch—9 trainees continued their training and 1 absconded.

Third Batch—8 trainees continued their training.

Fourth Batch—6 trainees continued their training and 1 resigned.

Fifth Batch—10 trainees continued their training.

Sixth Batch—8 trainees continued their training.

Seventh Batch—4 trainees continued their training.

203. **Recess Work.**—The 9 T.Ts.T. 'B' (Stereo Operators) completed their training in air survey.

204. **Field Work.**—The T.Ts.T. 'B' (Stereo Operators) were given training in plane-tabling on 1 : 4,000 and 1 : 50,000 scales under 2 Class III Division II Instructors. They were also given training in ground verification and height control on air photographs under 1 Class III Division II as instructor.

The first four batches completed their training in plane-tabling on 1 : 1,000 and 1 : 25,000 scales and continued their training in plane-tabling on 1 : 50,000 scale under 3 Class III Division II as Camp Officers assisted by 1 Class III Division II as instructor.

The fifth and sixth batches of trainees completed their training in plane-tabling on 1 : 1,000 scale and commenced their training in plane-tabling on 1 : 25,000 scale under Shri T. Susairaj, Survey Assistant, as Camp Officer assisted by 1 Class III Division II as instructor.

205. **Description of Country.**—Training area for plane-tabling on 1 : 1,000 scale lies in Bangalore and consists of plains with built-up area. Training areas for plane-tabling on 1 : 25,000 and 1 : 50,000 scales lies about 64 kilometres north of Bangalore in Bangalore and Kolār Districts of Mysore State. The country consists of medium high and low hills with open and undulating cultivated valleys.

206. **Miscellaneous.**—Except for minor cases of illness the health of personnel in general remained satisfactory.

No. 36 (TRAINING) PARTY

Officer in charge :—Major D. P. Hajela, B.Sc., B.E. (Civil), Engineers, from 7-1-63 to 11-1-63.
Major J. P. G. King, B.Sc., B.T., Engineers, from 12-1-63 to 22-1-63.
Shri J. E. David, M.A., from 23-1-63.

207. **General.**—The unit was raised on 7th January 1963 for training of Topo Trainees Type 'A', Class III Division I Service and above. The normal course of training is of one year's duration.

The headquarters of the unit remained at Dehra Dūn (U.P.) throughout the period under report.

208. **Personnel.**—The average strength of the instructional staff was 1 Class I Officer, 2 Class II Officers and 3 Class III Division II personnel.

209. **Training.**—

1963-64 Course—30 Topo Trainees Type 'A' commenced their training.

210. **Recess Work.**—Sarva Shri Mahindar Singh (Class II) and G. N. Dubey (Class II) gave training to 30 T.Ts.T. 'A' for 4 weeks' in pre-field work, viz., fair mapping and fusion practice.

211. **Field Work.**—Two field camps, one under Shri Mahindar Singh (Class II) assisted by two instructors, Class III Division II and the other under G. N. Dubey (Class II) assisted by two instructors, Class III Division I, imparted training in plane-tabling on 1 : 4,000 and 1 : 50,000 scales to 30 Topographical Trainees Type 'A' in Jamanipur and Devi Temple (Rājpur) area.

212. **Description of Country.**—The area for training in plane-tabling on 1 : 4,000 scale (Jamanipur area) was open country containing well-defined details. The area for training in plane-tabling on 1 : 50,000 scale (Devi Temple area) consisted of steep hills, partly covered with fairly dense vegetation, and adjoining undulating plains with deep cut *nālās*.

213. **Miscellaneous.**—Health of all personnel remained satisfactory.

PART II—MAP PUBLICATION AND OFFICE WORK

IX. INTRODUCTION

214. Progress of Map Publication.—Index maps, *D*, *E*, *F* and *G* at the end of this report show the progress of publication to date for all standard series of modern maps, the maintenance of which is a departmental commitment of the Survey of India.

215. Work of Map Drawing and Printing Offices.—The work of Drawing and Printing Offices of the department for the period under report is described in three sections as follows :—

Section XI (Page 137) gives statistics of departmental maps published, extra-departmental printing and map issues.

Section XII (Page 141) describes the work of the Drawing Offices and includes two tables which quantitatively summarize this work.

Section XIII (Page 143) describes the work of the Printing Offices.

216. Map Publication Policy.—The Map Publication Office continued to be responsible for the departmental series of geographical mapping and for those maps which formed the international mapping commitments, such as the World Aeronautical Charts (I.C.A.O.) and the 1 : Million Carte Internationale du Monde Series. The new map of India and Adjacent Countries on 1 : 12 Million scale remained under drawing and the new edition of 40-mile Wall Map of India and Adjacent Countries, was passed on for printing. The new edition of the 1 : 2·5 Million Road Map of India remained under publication and the new 1 : 4·5 Million Political Map of India (English Edition), was taken up for drawing. The work on these maps progressed steadily.

The maps for the National Atlas of India were in the progress of proving and printing. One map was published and 52 remained under various stages of printing at the end of the period under report.

Work for the re-issue of the Map Catalogue ; on the maps of the 1 : Million Carte Internationale du Monde Series and on the 1 : 2 Million Southern Asia Series also progressed steadily.

New edition of topographical sheets were continued to be printed in full colours while re-print cases continued to be printed in reduced colours. During the period under report 61 new maps were

published including 41 maps corresponding to the former one-inch scale maps on 1 : 50,000 scale in metric system. New compilation of the maps on the scale 1 : 250,000 also continued in the regional Drawing Offices.

In addition to the departmental maps summarized above, mapping and printing jobs for various departments of the Central and State Governments were also undertaken and completed.

X. PERSONNEL OF THE MAP PUBLICATION DIRECTORATE AND OF HEADQUARTERS OFFICES EMPLOYED ON MAP DRAWING AND PRINTING

Dehra Dūn. **Director, Map Publication**

Shri J. C. Ross, A.R.I.C.S., M.I.S., to 5-8-62.

Colonel R. S. Kalha, M.I.S., from 6-8-62.

Deputy Director, Map Publication

Shri P. S. Shinghal, C.E. (Hons.), A.M.I.E., to 13-6-62.

Shri J. C. Ross, A.R.I.C.S., M.I.S., from 14-6-62 to 25-6-62 (additional charge).

Lt.-Colonel D. N. Sharma Atri Harnal, Engineers, from 26-6-62.

Assistant Director, Map Publication

Shri G. C. Aggarwala, B.A., M.I.S., to 2-9-62 and from 10-9-62.

Shri J. Chatterjee, B.Sc., M.I.S., from 3-9-62 to 9-9-62 (additional charge).

Attached to Headquarters Office

Class II	..	Officer Surveyors (one up to 4-7-62 and one from 8-5-62).	2
„ II	..	Medical Officer	1
Class III	Division I	Draftsman (Selection Grade)	1
„ III	„	I Draftsmen (one from 14-9-62)	2
„ III	„	II Draftsmen	13
„ III	„	II Plane-tabler (up to 31-5-62)	1

No. 1 Drawing Office

Officer in charge—

Shri J. Chatterjee, B.Sc., M.I.S., to 31-10-62 and from 1-12-62 to 26-3-63.

Shri G. C. Aggarwala, B.A., M.I.S., from 1-11-62 to 30-11-62 and from 27-3-63.

Class II	..	Officer Surveyors	6
„ III	Division I	Surveyor	1
„ III	„	I Draftsmen (Selection Grade)	3
„ III	„	I Draftsmen	6
„ III	„	II Draftsmen (including trainees)	117
„ III	„	II Plane-tabler	1

Photo-Litho Office (Hāthībarkala)

Managers—

Shri B. C. Dutta, B.A., DIP. (Tech.), (Leeds), A.R.P.S. (London), to 18-6-62.

Shri K. L. Dev, from 19-6-62.

Class II	..	Assistant Managers ..	.. 3
,, III Division	I	Reproduction Assistants	.. 16
,, III ,,	II	Reproduction Personnel	.. 155

Photo-Zinco Office

Managers—

Shri K. L. Dev, to 18-6-62.

Shri B. C. Dutta, B.A., DIP. (Tech.), (Leeds), A.R.P.S. (London), from 19-6-62.

Class II	..	Assistant Manager ..	.. 1
,, III Division	I	Reproduction Assistants	.. 6
,, III ,,	II	Reproduction Personnel	.. 73

Letterpress Printing Section
(Under the technical control of Manager, P.Z.O.)

Class II	..	Assistant Manager ..	.. 1
,, III Division	I	Reproduction Assistants	.. 2
,, III ,,	II	Reproduction Personnel	.. 38

Map Record and Issue Office

Officer in charge—

Shri R. L. Ghei, B.A. (Hons.), A.M.I.S., to 1-4-62.

Shri Suresh Prasad, B.SC., from 2-4-62 to 5-8-62.

Shri J. E. David, M.A., from 6-8-62 to 22-1-63.

Shri M. K. Chatterjee, B.SC., from 23-1-63.

Works Office (Hāthībarkala)

Electrical Engineer—

Shri A. L. Sood, to 12-5-62.

(Shri K. Mulkraj, Technical Assistant, Division I took over the current duty charge, from 13-5-62. Subsequently the post of Electrical Engineer was re-designated to that of Works Manager).

Calcutta. **Director, Eastern Circle**

Colonel J. S. Paintal, M.I.S., M.I.E.

Deputy Director, Eastern Circle

Shri J. C. Sikka, B.A., A.M.I.S., to 9-11-62 and again from 1-1-63.

Colonel J. S. Paintal, M.I.S., M.I.E., from 10-11-62 to 31-12-62 (additional charge).

Attached to Headquarters Office

Class	II	..	Officer Surveyor ..	.. 1
,,	II	..	Map Curator ..	.. 1
,,	III	Division I	Surveyor (Selection Grade)	.. 1
,,	III	,, I	Survey Assistant ..	.. 1
,,	III	,, I	Reproduction Assistant	.. 1
,,	III	,, II	Reproduction Personnel	.. 34

No. 5 Drawing Office

Officer in charge—

Shri N. L. Gupta, C.E., M.I.S., to 31-7-62 and fron 3-9-62.
Shri J. C. Sikka, B.A., A.M.I.S., from 1-8-62 to 2-9-62.

Class	II	..	Officer Surveyor ..	.. 1
,,	III	Division I	Surveyor (Selection Grade)	.. 1
,,	III	,, I	Surveyors	.. 3
,,	III	,, I	Draftsmen (Selection Grade)	.. 2
,,	III	,, I	Draftsmen	.. 6
,,	III	,, II	Air Survey Draftsman	.. 1
,,	III	,, II	Plane-tabler ..	.. 1
,,	III	,, II	Draftsmen (including trainees)	.. 89

Photo-Litho Office (Calcutta)

Manager—

Shri P. N. Kirpal, B.A., DIP. in printing (London).

Class	II	..	Assistant Managers ..	.. 2
,,	III	Division I	Reproduction Assistants	.. 9
,,	III	,, II	Reproduction Personnel	.. 117

Engraving Office

Class	II	(Non-Gazetted)	Assistant Head Engraver	.. 1
,,	III	Division I	Engraver ..	.. 1
,,	III	,, II	Engravers ..	.. 13
,,	III	,, II	Reproduction Personnel	.. 6

Dehra Dūn. **Director, Northern Directorate**

Colonel S. K. S. Mudaliar, B.A., M.I.E., M.R.S.H., M.I.S.

Deputy Director, Technical

Lt.-Colonel Y. Ramachandran, B.SC. (Mining), A.M.I.E., Engineers, from 9-4-62 to 15-12-62 and from 16-1-63.

Lt.-Colonel M. L. Chopra, B.SC., B.E., A.M.I.E., Engineers, from 16-12-62 to 15-1-63.

No. 2 Drawing Office

Officer in charge—

Shri U. D. Mamgain, B.SC., M.I.S., to 29-9-62 and from 1-11-62.

Shri R. L. Ghei, B.A. (Hons.), A.M.I.S., from 30-9-62 to 31-10-62.

Class II ..	Officer Surveyors	.. ..	2
,, III Division I	Surveyors	.. ..	2
,, III ,, I	Draftsmen	.. ..	5
,, III ,, II	Draftsmen	.. ..	75

No. 6 Drawing Office

Officer in charge—

Shri R. L. Ghei, B.A. (Hons.), A.M.I.S., from 2-4-62.

Class II ..	Officer Surveyors	.. ..	2
,, III Division I	Survey Assistant	.. ..	1
,, III ,, I	Draftsmen	.. ..	4
,, III ,, II	Draftsmen	.. ..	50

Bangalore. **Director, Southern Circle**

Shri L. J. Bagnall, B.SC., to 19-12-62.

Shri J. C. Ross, A.R.I.C.S., M.I.S., from 20-12-62.

Deputy Director, Southern Circle

Shri L. J. Bagnall, B.SC., from 25-5-62 (additional charge).

(The post of Deputy Director was transferred to Northern Directorate for the period from 5-3-62 to 24-5-62).

No. 4 Drawing Office

Officer in charge—

Shri J. Narasimhan, B.SC. (Hons.), to 15-8-62.

Shri Suresh Prasad, B.SC., from 16-8-62.

Class II ..	Officer Surveyors	.. ..	3
,, III Division I	Surveyors	.. ..	3
,, III ,, I	Draftsmen	.. ..	5
,, III ,, II	Draftsmen (including trainees)	..	73
,, III ,, II	Plane-tablers	.. ..	2
,, III ,, II	Trig. Computer	.. ..	1

Abu.

Director, Western Circle

Colonel C. M. Sahni, B.A.

Deputy Director, Western Circle

Lt.-Colonel D. N. Sharma Atri Harnal, Engineers, to 17-6-62.

Colonel C. M. Sahni, B.A., from 18-6-62 to 30-7-62 (additional charge).

Shri P. S. Shinghal, C.E. (Hons.), A.M.I.E., from 31-7-62.

No. 3 Drawing Office

Officer in charge—

Shri H. H. Phillips, B.Sc. (Hons.), M.I.S.

Class	II	..	Officer Surveyors	2
,,	III	Division I	Surveyor	1
,,	III	,, I	Survey Assistant	1
,,	III	,, I	Draftsmen	7
,,	III	,, II	Draftsmen (including trainees) ..	79

Table I(*a*)—Departmental Maps published

Class of Maps	Scale	New Publications				New Editions and Reprints					Number of copies printed				
		Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Total		Dehra Dūn		Calcutta	Total	
		Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle	New Editions	Reprints	Map Publication Office		Eastern Circle		Map
		H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.			H.L.O.	P.Z.O.	P.L.O.		H.L.(
GENERAL MAPS															
Maps of India	Various	..	..	..	..	2	..	..	..	2	25,647	..	..	25,647	45,2(
GEOGRAPHICAL MAPS															
Southern Asia Series ..	1 : 2 M	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Carte Internationale du Monde..	1 : M	..	..	..	..	..	..	..	..	..	..	..	..	..	..
World Aeronautical Charts (I.C.A.O.)	1 : M	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TOPOGRAPHICAL MAPS															
1 : 25,000 maps	1 : 25,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1 : 50,000 maps	1 : 50,000	31	10	..	41	..	..	..	..	..	1,52,016	52,463	..	2,04,479	3,04,03
1 : 250,000 maps	1 : 250,000	..	..	..	..	..	..	..	..	..	..	..	..	..	..
¼-inch (Modern)	1″ = 4 miles	..	..	..	..	9	2	2	2	11	28,838	6,302	4,600	39,740	42,35
„ (Preliminary) ..	„	..	..	..	..	..	..	..	..	..	..	..	..	..	..
„ (Provisional) ..	„	..	..	..	..	..	..	..	..	..	..	..	..	..	..
½-inch (Modern)	1″ = 2 miles	..	..	..	..	4	2	..	4	2	10,936	5,302	..	16,238	10,93
1-inch (Modern)	1″ = 1 mile	14	5	1	20	51	25	36	38	74	2,41,343	1,08,383	1,02,981	4,52,707	3,19,69
„ (Preliminary) ..	„	..	..	..	..	1	..	2	..	3	5,251	..	10,200	15,451	5,25
„ (Provisional) ..	„	..	..	..	..	3	..	..	..	3	9,601	..	..	9,601	9,60
Old Style maps (1-inch & ½-inch Primary)	„	..	..	..	..	..	..	..	..	..	..	..	..	..	..
SPECIAL MAPS															
Maps of States	1 : M	..	..	..	..	..	..	..	..	..	..	..	..	..	..
City and Town Guide Maps ..	Various	..	..	..	..	..	..	..	..	..	..	..	..	..	..
School Atlas (Deluxe Edn.) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
School Atlas (Popular Edn.) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Index Maps	Various	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Miscellaneous Maps, Charts and Diagrams	„	7	..	..	7	..	..	..	..	..	8,527	..	..	8,527	17,52(
Total ..		52	15	1	68	70	29	40	44	95	4,82,159	1,72,450	1,17,781	7,72,390	7,54,66(

Table I(*a*)—Departmental Maps published

Reprints			Number of copies printed				Value in Rupees				List of First and New Edition sheets printed					
utta	Total		Dehra Dūn		Calcutta		Dehra Dūn		Calcutta							
Circle	New Editions	Reprints	Map Publication Office		Eastern Circle	Total	Map Publication Office		Eastern Circle	Total	Scale	Sheet No.	Edition Number and Date	Scale	Sheet No.	Edition Number and Date
.O.			H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.							
.	..	2	25,647	..	..	25,647	45,269	..	..	45,269	1 : 50,000	40 J/7	1st 1959	1″ = 1 mile	44 N/15	3rd 1959
												40 J/8	1st 1959		44 O/11	3rd 1958
												40 J/11	1st 1959		44 O/15	2nd 1958
												40 J/12	1st 1959		44 O/16	3rd 1958
												40 J/16	1st 1959		44 P/10	2nd 1961
.	..	..	..	..	..	..	..	..	..	..		40 K/9	1st 1959		46 B/11	1st 1960
.	..	..	..	..	..	..	..	..	..	..		40 K/13	1st 1959		46 B/14	3rd 1960
												40 M/8	1st 1959		46 F/1	2nd 1960
.	..	..	..	..	..	..	..	..	..	..		40 M/12	1st 1959		46 F/2	1st 1960
												40 M/15	1st 1959		46 F/3	1st 1960
												40 M/16	1st 1959		47 E/8	3rd 1960
												40 N/1	1st 1959		47 F/2	3rd 1960
.	..	..	..	..	..	..	..	..	..	..		40 O/4	1st 1960		47 G/7	1st 1960
.	..	..	1,52,016	52,463	..	2,04,479	3,04,032	1,04,926	..	4,08,958		40 P/10	1st 1960		47 K/9	2nd 1960
.	..	..	..	..	..	..	..	..	..	..		44 I/14	1st 1961		47 K/10	2nd 1960
2	2	11	28,838	6,302	4,600	39,740	42,358	9,453	6,900	58,711		44 I/15	1st 1960		53 B/9	5th 1961
.	..	..	..	..	..	..	..	..	..	..		44 I/16	1st 1960		53 E/8	4th 1961
.	..	..	..	..	..	..	..	..	..	..		44 J/3	1st 1962		53 F/8	4th 1957
.	4	2	10,936	5,302	..	16,238	10,936	5,302	..	16,238		44 J/4	1st 1962		53 F/9	3rd 1960
6	38	74	2,41,343	1,08,383	1,02,981	4,52,707	3,19,694	1,67,064	1,06,597	5,93,355		44 J/7	1st 1962		53 P/5	3rd 1961
2	..	3	5,251	..	10,200	15,451	5,251	..	10,200	15,451		44 J/8	1st 1962		54 A/13	2nd 1960
.	..	3	9,601	..	..	9,601	9,601	..	..	9,601		44 J/13	1st 1961		54 L/13	1st 1926
												44 K/9	1st 1961		(Orange	Surprint)
.	..	..	..	..	..	..	..	..	..	..		44 K/13	1st 1961		54 O/2	2nd 1960
												44 M/2	1st 1961		54 P/4	2nd 1957
												44 M/3	1st 1960		54 P/5	2nd 1961
												44 M/4	1st 1960		72B/14	2nd 1958
												44 M/6	1st 1960		58 A/7	5th 1957
.	..	..	..	..	..	..	..	..	..	..		44 M/7	1st 1961		72 O/6	3rd 1960
.	..	..	..	..	..	..	..	..	..	..		44 M/8	1st 1960		72 O/9	2nd 1960
.	..	..	..	..	..	..	..	..	..	..		44 M/10	1st 1961		72 O/10	3rd 1960
.	..	..	..	..	..	..	..	..	..	..		44 M/11	1st 1961		72 O/13	3rd 1963
.	..	..	..	..	..	..	..	..	..	..		44 M/12	1st 1959		73 D/1	2nd 1960
.	..	..	8,527	..	..	8,527	17,528	..	..	17,528		44 M/13	1st 1961		73 D/4	2nd 1961
												44 N/1	1st 1962		73 D/6	2nd 1961
												44 N/3	1st 1962		73 D/10	2nd 1961
												44 N/5	1st 1960		73 D/16	2nd 1961
												44 N/9	1st 1961		73 G/16	2nd 1959
												45 A/8	1st 1959		73 J/10	2nd 1960
												45 A/11	1st 1959		73 K/11	2nd 1960
												45 A/16	1st 1959		73 K/15	2nd 1960
															74 A/11	2nd 1961
											1″ = 1 mile	40 I/4	1st 1958		83 B/4	2nd 1961
												40 M/6	1st 1957		83 B/14	3rd 1961
												41 E/13	1st 1960			
												41 F/16	1st 1960	1″ = 2 miles	54C/SE	3rd 1960
												41 G/10 & 6	2nd 1960		54 G/SE	2nd 1961
												41 I/10	1st 1960		54 G/SW	2nd 1961
												41 J/3	2nd 1960		56 O/SE	4th 1960
												41 J/8	2nd 1960			
												43 P/12	4th 1959	1″ = 4 miles	54 O	7th 1960
												43 P/16	3rd 1959		56 H	3rd 1959
												44 D/7	1st 1958			
												44 K/1	1st 1962			
												44 K/5	1st 1962			
												44 M/9	3rd 1959			
												44 N/8	3rd 1959			
0	44	95	4,82,159	1,72,450	1,17,781	7,72,390	7,54,669	2,86,745	1,23,697	11,65,111						

Table I(*b*)—Extra-Departmental Maps printed

Class of Maps	Scale	NEW PUBLICATIONS				NEW EDITIONS AND REPRINTS				NUMBER OF COPIES PRINTED				VALUE IN RUPEES			
		Dehra Dūn		Calcutta		Dehra Dūn		Calcutta		Dehra Dūn		Calcutta		Dehra Dūn		Calcutta	
		Map Publication Office		Eastern Circle	Total	Map Publication Office		Eastern Circle	Total	Map Publication Office		Eastern Circle	Total	Map Publication Office		Eastern Circle	
		H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.	
PRINTED FOR OTHER DEPARTMENTS OF THE CENTRAL AND STATE GOVERNMENTS																	
Geographical Maps																	
1 : Million maps	1 : 1 Million	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Miscellaneous maps	Various	..	..	..	..	3	..	..	3	12,515	..	..	12,515	18,272	..	..	
Topographical Maps																	
½-inch maps	1″ = 4 miles	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
1 inch maps	1″ = 1 mile	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Special Maps																	
Large Scale Maps	Various	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Maps for Irrigation, Hydro-electric and other Projects ..	16″ = 1 mile	4	..	..	4	..	..	..	..	2,121	..	..	2,121	3,394	..	..	
Do. ..	8″ = 1 mile	7	..	..	7	..	..	..	..	1,326	..	..	1,326	7,627	..	..	
Do. ..	6″ = 1 mile	7	2	..	9	..	..	..	..	1,047	1,046	..	2,093	5,494	764	..	
Do. ..	4″ = 1 mile	180	42	10	232	..	..	..	..	52,745	12,594	4,464	69,803	1,63,460	42,901	18,001	2
Do. ..	2″ = 1 mile	7	..	..	7	..	..	..	..	261	..	..	261	4,033	..	..	
Do. ..	Various	21	1	..	22	..	..	..	..	11,311	1,535	..	12,846	18,217	13,331	..	
Forest Maps ..	,,	2	..	..	2	..	..	..	..	318	..	..	318	1,828	..	..	
Miscellaneous Maps, Plans, Charts and Diagrams	..	94	..	3,075	3,169	17	..	..	17	2,63,917	..	15,09,210	17,73,127	1,35,991	..	1,05,178	2
Total ..		322	45	3,085	3,452	20	..	..	20	3,45,561	15,175	15,13,674	18,74,410	3,58,316	56,996	1,23,179	6
PRINTED FOR COMMERCIAL FIRMS AND THE PUBLIC																	
Miscellaneous Maps, Plans, Charts and Diagrams	Various	7	..	16	23	..	..	..	..	1,10,596	..	6,124	1,16,720	10,312	..	14,189	
Total ..		7	..	16	23	..	..	..	..	1,10,596	..	6,124	1,16,720	10,312	..	14,189	
Grand Total .		329	45	3,101	3,475	20	..	..	20	4,56,157	15,175	15,19,798	19,91,130	3,68,628	56,996	1,37,368	8

Table I(*c*)—Litho-printing other than maps

	NUMBER OF ITEMS PRINTED				NUMBER OF COLOURS PRINTED			NUMBER OF COPIES PRINTED				VALUE IN RUPEES			
	Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Total
	Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle	Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle	
	H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.	H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.	
DEPARTMENTAL WORK															
Posters	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Booklets	22	..	..	22	8	..	..	22,906	..	..	22,906	1,04,362	..	..	1,04,362
Miscellaneous	7	..	42	49	1	..	1	21,701	..	4,322	26,023	13,282	..	5,742	19,024
Total ..	29	..	42	71	..	..	..	44,607	..	4,322	48,929	1,17,644	..	5,742	1,23,386
EXTRA-DEPARTMENTAL WORK FOR OTHER CENTRAL AND STATE GOVERNMENT DEPARTMENTS															
Posters	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Booklets	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Miscellaneous	25	13	344	382	4	3	2	1,14,467	41,556	23,40,212	24,96,235	76,408	1,097	94,926	1,72,431
Total ..	25	13	344	382	..	..	..	1,14,467	41,556	23,40,212	24,96,235	76,408	1,097	94,926	1,72,431
EXTRA-DEPARTMENTAL WORK FOR COMMERCIAL FIRMS AND THE PUBLIC															
Posters	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Booklets	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Miscellaneous	1	..	1	2	2	..	1	18,480	..	4,400	22,880	19,575	..	547	20,122
Total ..	1	..	1	2	..	..	..	18,480	..	4,400	22,880	19,575	..	547	20,122
Grand Total ..	55	13	387	455	..	..	..	1,77,554	41,556	23,48,934	25,68,044	2,13,627	1,097	1,01,215	3,15,939

PUBLICATIONS AND ISSUES

Table I(*d*)—Photographic Work

	Number of items printed				Number of copies printed				Value in Rupees			
	Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Total	Dehra Dūn		Calcutta	Total
	Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle		Map Publication Office		Eastern Circle	
	H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.		H.L.O.	P.Z.O.	P.L.O.	
DEPARTMENTAL												
Kodalines ..	4	23	7	34	541	164	121	826	18,943	10,089	5,790	34,822
Bromide Prints ..	10	84	3	97	155	16,815	63	16,993	1,416	1,58,464	1,074	1,60,954
Glass Prints ..	286	..	..	286	558	..	..	558	4,470	..	..	4,470
Diapositives ..	..	40	..	40	..	6,453	..	6,453	..	1,71,523	..	1,71,769
Total (Departmental)	300	147	10	457	1,214	23,432	184	24,830	24,829	3,40,076	6,864	3,71,769
EXTRA-DEPARTMENTAL												
Kodalines ..	..	3	1	4	..	10	3	13	..	559	106	665
Bromide Prints ..	2	17	5	24	23	904	112	1,039	252	8,795	1,851	10,898
Glass Prints ..	225	..	..	225	436	..	..	436	2,893	..	..	2,893
Diapositives ..	..	..	..	..	..	..	..	..	..	..	..	..
Total (Extra-departmental) ..	227	20	6	253	459	914	115	1,488	3,145	9,354	1,957	14,456
Grand Total ..	527	167	16	710	1,673	24,346	299	26,318	27,974	3,49,430	8,821	3,86,225

XI. PUBLICATIONS, EXTRA-DEPARTMENTAL PRINTING AND MAP ISSUES

217. **Publications and Extra-departmental Printing.**—The publications of the department and the printing done for other government departments and for the public during the period under report are summarized in the following tables :—

Table I(*a*) Departmental maps.
Table I(*b*) Extra-departmental maps.
Table I(*c*) Litho-printing, other than maps.
Table I(*d*) Photographic work.

The total progress made up to the end of the period under report in respect of the publication of the main series of topographical and geographical maps produced by the department is given in Table II. Table III shows the letterpress publications for the period.

Table II—Progress in Publication of Modern Topographical and Geographical Maps

	India				India and Adjacent Countries			
					1 : Million			1:2 Million
	1″ = 1 mile	1 : 50,000	1″ = 4 miles	1 : 250,000	Carte Internationale du Monde	World Aeronautical Charts (I.C.A.O.)	State Maps	Southern Asia Series
Maps Published								
Primary	3,075†	47	8	..	..	..	..	..
Compiled	..	..	241*	..	29(*a*)	10	1	24(*b*)
Remaining (Approximate)								
Primary	1962		..		..	..	..	..
Compiled	..		145		..	13	25	..
Total (Approx.) ..	5,084		394		29	23	26‡	24

In addition to above, 248 half-inch sheets are also current which previously formed the departmental responsibility. These are in the course of being replaced by 1 : 50,000 sheets gradually.

* In addition, 102 quarter-inch sheets have been published in modern style, but based wholly or partly on old surveys.

† In addition, 47 1-inch sheets have been published in modern style, but based wholly or partly on old surveys.

‡ Hindi and English editions of 13 State Maps.

(*a*) Total number falling in India.

(*b*) Cover allotted as departmental responsibility.

Table III—Letterpress Publications

Departmental—

(*a*) PUBLISHED AT DEHRA DŪN

1. Tide Tables Bombay 1963.
2. Tide Tables Kandla 1963.
3. Tide Tables Rangoon 1963.
4. Tide Tables Indian Ocean 1963.
5. Tide Tables Hooghly River 1963.
6. Addendum to Gravity data in India.
7. National Report on the Gravimetric Work of Survey of India.
8. Survey of India General Report 1956.
9. Instructions for Medicine Chests and Boxes for Survey Officers.

(*b*) PUBLISHED AT CALCUTTA

Miscellaneous departmental forms, etc.

Extra-departmental—

About 25 extra-departmental publications were printed in Letterpress Section at Dehra Dūn and included Notices to Mariners, the Journal of the Institution of Surveyors and a number of publications for the Forest Research Institute, Dehra Dūn. In Calcutta, a large variety of Agmark labels was printed.

Out-turn of Letterpress Sections

Sections	Items or pages published	Copies printed	Impressions pulled
Dehra Dūn ..	840	27,49,767	43,05,162
Calcutta ..	117	13,75,913	12,45,968
TOTAL ..	957	41,25,680	55,51,130

218. **Map Issues.**—Table IV summarizes the sale and issue of both departmental and extra-departmental maps by the various offices of the Survey of India, during the period under report. Table V, which follows, gives the stocks held on 31st March 1963 of all departmental maps and of those extra-departmental maps which are normally stocked for sale.

Table IV—Maps issued by Survey of India Offices

	Central and State Government Departments		Public		Total		Free Issues	
	Number of copies	Sale value in Rupees	Number of copies	Sale value in Rupees	Number of copies	Sale value in Rupees	Number of copies	Sale value in Rupees
DEPARTMENTAL								
Dehra Dūn	13,32,062	13,91,841	60,835	1,42,397	13,92,897	15,34,238	473	829
Calcutta	5,70,684	5,84,855	9,161	15,651	5,79,845	6,00,506	100	135
Bangalore	2,692	5,318	6,307	20,367	8,999	25,685	..	..
Delhi	11,913	20,823	4,127	10,707	16,040	31,530	..	..
Total (Departmental) ..	19,17,351	20,02,837	80,430	1,89,122	19,97,781	21,91,959	573	964
EXTRA-DEPARTMENTAL								
Dehra Dūn	8,70,594	7,50,049	1,064	36,663	8,71,658	7,86,712	..	..
Calcutta	29,34,941	1,55,778	8,411	19,968	29,43,352	1,75,746	32	32
Bangalore	..	..	2	2	2	2	..	..
Delhi	..	..	..	..	..	..	..	..
Total (Extra-departmental) ..	38,05,535	9,05,827	9,477	56,633	38,15,012	9,62,460	32	32
Grand Total ..	57,22,886	29,08,664	89,907	2,45,755	58,12,793	31,54,419	605	996

Note:—Total mounting charges during the period.

Dehra Dūn Rs. 14,203
Calcutta ,, 8,039

Calcutta
Stock transfer of:—
(*a*) Departmental copies 53,241
Value Rs. 77,057
(*b*) Extra-departmental copies 15
value Rs. 15

Table V—Stock of Maps

(This table gives the stock as on 31st March 1963 of Departmental maps and of those Extra-departmental maps of which stocks are held for sale)

	CALCUTTA		DEHRA DŪN		BANGALORE		DELHI		TOTAL	
	Eastern Circle Office		Map Record and Issue Office		Southern Circle Office		Map Sales Office			
	Number of copies in stock	Present face value Rs.	Number of copies in stock	Present face value Rs.	Number of copies in stock	Present face value Rs.	Number of copies in stock	Present face value Rs.	Number of copies in stock	Present face value Rs.
DEPARTMENTAL MAPS										
1 : 2 M Southern Asia Series	8,211	16,422	2,567	5,134	250	500	..	..	11,028	22,056
1 : M Carte Internationale du Monde ..	9,478	17,080	9,424	28,272	377	1,093	212	600	19,491	47,045
1 : M World Aeronautical Charts (I.C.A.O.)	677	2,031	9,304	27,912	673	2,019	..	..	10,654	31,962
1 : M India & Adjacent Countries Series (abandoned)	7,546	11,319	..	..	..	..	..	..	7,546	11,319
1 : 50,000 topographical maps	1,688	3,376	74,193	1,48,386	109	218	203	406	76,193	1,52,386
1 : 25,000 topographical maps	4,969	9,938	21,869	65,607	312	624	676	1,350	27,826	77,519
½-inch topographical maps ..	38,889	51,389	1,85,933	2,63,318	3,533	5,199	5,477	7,000	2,33,832	3,26,906
½-inch topographical maps (Primary & compiled)	1,01,927	1,22,620	1,61,652	1,74,017	5,280	5,915	13,453	14,000	2,82,312	3,16,552
1 inch topographical maps	4,76,558	5,69,759	11,31,900	11,99,707	51,781	61,782	56,218	56,094	17,16,457	18,87,342
General maps of India	2,378	3,967	18,637	30,995	1,536	2,585	77	93	22,628	37,640
Maps of States	2,693	6,708	2,052	4,678	81	243	..	..	4,826	11,629
City & Town Guide Maps	9,994	20,597	19,312	36,481	122	306	1,354	3,385	30,782	60,769
Miscellaneous maps, charts, diagrams and School Atlases	4,831	6,910	47,453	74,745	463	1,341	223	437	52,970	83,433
TOTAL ..	6,69,839	8,42,116	16,84,296	20,59,252	64,517	81,825	77,893	83,365	24,96,545	30,66,558
EXTRA-DEPARTMENTAL MAPS STOCKED FOR SALE										
Large scale maps	1,940	3,880	6,751	19,502	108	216	..	..	8,799	23,598
Forest Maps	..	..	512	1,536	..	..	..	..	512	1,536
Topographical maps on special lay-out ..	1,904	3,915	988	2,957	127	190	..	..	3,019	7,062
Instrument Approach & Landing Charts (I.C.A.O.)	..	..	..	..	..	..	..	..	..	..
Miscellaneous maps, charts & diagrams ..	..	..	8,142	16,284	42	63	..	..	8,184	16,347
TOTAL ..	3,844	7,795	16,393	40,279	277	469	..	..	20,514	48,543
EXTRA-DEPARTMENTAL MAPS STOCKED FOR SALE ON BEHALF OF THE NATIONAL ATLAS ORGANIZATION										
National Atlas, Deluxe Edition (in Hindi)	1	125	558	69,750	11	1,375	8	1,000	578	72,250
National Atlas, Popular Edition (in Hindi)	6	600	1	100	19	1,900	..	..	26	2,600
Loose sheets (in Hindi)	..	..	596	2,980	..	..	..	..	596	2,980
Introductory notes (in Hindi).. ..	..	..	12	6	..	..	..	..	12	6
TOTAL ..	7	725	1,167	72,836	30	3,275	8	1,000	1,212	77,836

XII. WORK OF DRAWING OFFICES

219. No. 1 Drawing Office, Dehra Dūn.—This office was organized in various sections, dealing with the following types of maps:—

(*i*) World Aeronautical Charts of the International Civil Aviation Organization, and Approach and Landing Charts and Obstruction Charts for the Director General of Civil Aviation, Government of India.

(*ii*) General maps of India.

(*iii*) 1 : M Carte Internationale du Monde Series.

(*iv*) 1 : 2 M maps of Southern Asia Series.

(*v*) Forest maps.

(*vi*) Extra-departmental maps for other Government departments, on payment.

(*vii*) The School Atlas and the Map Catalogue.

One section was engaged on scrutiny of the external boundary of India on all departmental and extra-departmental maps printed in the department. This section also scrutinized maps for the correct depiction of the external boundary of India that were printed elsewhere by Government or private agencies.

For maintaining maps, up to date detailed information continued to be collected from the departments of the Central and State Governments.

A considerable amount of correspondence relating to the correct spellings of Geographical and place names was also handled.

220. No. 2 Drawing Office, Dehra Dūn.—This office was mainly engaged on its normal work of reprint, reissue and compilation of topographical maps, and examination of primary sheets submitted by field parties.

Map maintenance was done by collecting corrections from State Government Departments. Correct spellings of place names in Roman and Devanāgari were also collected and supplied to the Railway and Postal authorities.

221. No. 3 Drawing Office, Abu.—This office was mainly engaged in mapping of the departmental standard sheets, compilation of topographical maps, reissue of existing maps, examination of primary sheets and the project maps submitted by field parties. The office was also engaged in fair drawing work on District Gazetteer maps for Rājasthān Government.

Maintenance of office copies of sheets of Western Circle area was also done by this office. Correct spellings of place names in

Roman and Devanāgari were also collected and supplied to the State Government and the local authorities.

222. **No. 4 Drawing Office, Bangalore.**—This office was primarily engaged on compilation work and mapping of departmental standard sheets, reprint/reissue of existing sheets, State Maps and map maintenance. It was also responsible for examination of primary sheets, large scale maps and other project sheets submitted by field parties.

Maintenance of all technical records for Southern Circle continued to be the responsibility of this office. Correct spellings of place names in Roman and Devanāgari were also collected and supplied to the State Government and to the Railway and Postal authorities.

223. **No. 5 Drawing Office, Calcutta.**—This office was mainly engaged on the normal work of compilation, reissue and reprint of topographical maps and map maintenance.

A number of extra-departmental jobs for other Government departments and private indentors were also completed.

The following miscellaneous jobs were also carried out :—

(*i*) Supply of correct spellings of towns, villages and railway stations, in Roman and Devanāgari to the Postal and Railway authorities.

(*ii*) Testing of stationery items, like water colours, waterproof inks, drawing papers, etc., for the Central Stationery Office, Calcutta.

(*iii*) Supply of 'distance' certificates to transport firms in Calcutta, on payment of fees.

224. **No. 6 Drawing Office, Dehra Dūn.**—This office was raised on 2nd April 1962 and remained mainly engaged in mapping of the departmental standard sheets and compilation of topographical maps.

225. **Engraving Office, Calcutta.**—In addition to the work of bringing the 1 : Million Carte Internationale du Monde Series up to date as usual, this office undertook and completed various miscellaneous jobs.

A large number of extra-departmental jobs were taken up and completed, such as engraving of the Letter-of-Appointment Plates for the President of India in English and Hindi, Standard Compasses for the Naval Hydrographic Office, Dehra Dūn and Certificate Plates for the Forest Research Institute.

226. **Summary of Drawing Work.**—Table VI, which follows, gives the number of new maps completed in the various drawing offices and field parties during the period under report and also the number of maps in hand at the end of the period.

Table VII shows the present state of progress of work involving new editions and reprints of departmental maps and the progress of extra-departmental maps.

WORK OF DRAWING OFFICES

Table VI—New Maps

(*a*) denotes work completed and (*b*) denotes work in hand

	DEPARTMENTAL																														EXTRA-DEPARTMENTAL (FOR THE CENTRAL AND ST									
	TOPOGRAPHICAL MAPS										GEOGRAPHICAL MAPS						GENERAL AND SPECIAL MAPS								ACCESSORY		MISCELLANEOUS						Total man-days, work in year under report	Topographical maps		Geographical maps		General maps		Maps of surveys for irrigation and other engineering projects		Large scale and Town maps	
	1 : 25,000		1 : 50,000		1-inch		1:250,000		¼-inch		Carte Internationale				World Aeronautical Charts (I.C.A.O.)		City and Town, etc., Guide Maps		District Maps		State Maps		India and Adjacent Countries		Hill Shading Sheets		Indexes		Charts		Various												
											Helio		Engraved																													
	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)		(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)
MAP PUBLICATION OFFICE																																								
No. 1 Drawing Office ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	..	..	..	..	..	..	..	9	..	1	1	3	..	1	1	70	1,362	..	..	..	..	..	..	..	..	..	..
NORTHERN DIRECTORATE																																								
No. 2 Drawing Office ..	..	..	13	1	2	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	1	..	..	1	1	..	..	..	..	..	..	3,997	..	..	..	..	..	..	..	..	..	..
No. 6 Drawing Office ..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	331	..	..	..	..	..	..	..	..	..	..
Field Parties ..	..	..	22	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,381	..	..	..	..	..	..	59	47	..	..
EASTERN CIRCLE																																								
No. 5 Drawing Office ..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	..	..	..	..	..	..	3,993	..	..	..	..	..	..	..	..	..	..
Engraving Office ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	86	6	2,395	..	..	..	..	..	..	..	..	..	..
Field Parties ..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	30	..	..	..	..	..	..	6	..	..	..
WESTERN CIRCLE																																								
No. 3 Drawing Office ..	..	..	8	33	..	..	1	13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	22	..	..	..	..	..	..	5,969	..	..	..	..	..	..	..	..	..	..
Field Parties ..	..	..	30	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3,572	..	..	..	..	..	..	99	92	..	..
SOUTHERN CIRCLE																																								
No. 4 Drawing Office ..	..	..	..	..	..	..	2	2	..	..	..	..	..	..	..	..	..	1	..	1	..	3	..	..	3	5	..	..	..	..	..	..	1,114	..	..	..	..	..	..	..	..	..	..
Field Parties ..	..	..	16	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	586	..	..	..	..	..	..	99	4	..	..
TOTAL ..	..	..	91	55	2	..	4	16	..	..	..	..	..	..	..	8	..	3	..	2	..	4	..	9	9	31	1	3	..	1	87	76	24,730	..	..	..	..	..	..	263	143	..	..

WORK OF DRAWING OFFICES

Table VI—New Maps

(*a*) denotes work completed and (*b*) denotes work in hand

EPARTMENTAL																		EXTRA-DEPARTMENTAL (FOR OTHER DEPARTMENTS OF THE CENTRAL AND STATE GOVERNMENTS)																EXTRA-DEPARTMENTAL (FOR COMMERCIAL FIRMS AND THE PUBLIC)		
	General and Special Maps								Acces-sory		Miscellaneous						Total man-days, work in year under report	Topo-graphical maps		Geogra-phical maps		General maps		Maps of surveys for irrigation and other engineering projects		Large scale and Town maps		Forest maps		Miscel-laneous maps, plans and diagrams, etc.		Engraved commission forms and certificates, etc.		Total man-days' work in year under report	Miscellaneous maps, plans, charts and diagrams		Total man-days' work in year under report
ld utical rts .O.)	City and Town, etc., Guide Maps		District Maps		State Maps		India and Adjacent Countries		Hill Shading Sheets		Indexes		Charts		Various																							
(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)		(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)		(*a*)	(*b*)	
8	..	..	..	..	..	..	..	9	..	1	1	3	..	1	1	70	1,362	..	..	..	..	..	..	..	..	..	..	..	14	12	59	..	..	1,854	..	..	
..	..	1	..	1	..	1	..	..	1	1	..	..	..	..	..	..	3,997	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	331	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,381	..	..	..	..	..	..	59	47	..	..	..	..	..	..	..	..	2,133	..	..	..
..	..	..	..	..	..	..	..	..	2	2	..	..	..	..	..	..	3,993	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	86	6	2,395	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	25	1	453
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	30	..	..	..	..	..	..	6	..	..	..	..	..	..	..	..	..	330	..	..	..
..	..	..	..	..	..	..	..	..	3	22	..	..	..	..	..	..	5,969	..	..	..	..	..	..	..	..	..	..	..	..	18	8	..	..	1,112	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3,572	..	..	..	..	..	..	99	92	..	..	21	..	..	..	..	..	4,747	..	..	..
..	..	1	..	1	..	3	..	..	3	5	..	..	..	..	..	..	1,114	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	586	..	..	..	..	..	..	99	4	..	..	..	..	..	..	..	..	3,758	..	..	..
8	..	3	..	2	..	4	..	9	9	31	1	3	..	1	87	76	24,730	..	..	..	..	..	..	263	143	..	..	21	14	30	67	..	..	13,934	25	1	453

Table VII—Reissue of departmental maps and of extra-departmental maps of which stocks are held for sale

(*a*) denotes work completed and (*b*) denotes work in hand

	TOPOGRAPHICAL														GEOGRAPHICAL								GENERAL AND SPECIAL										OFFICE COPIES	
	Modern style including preliminary editions								Old style including provisional issues						1 : M Carte Internationale				World Aeronautical Charts (I.C.A.O.)		1 : 2 Million Southern Asia Series				City and Town, etc., Guide maps		District maps		State maps		India and Adjacent Countries on scale smaller than 1 : 2 Million		Forest maps		Miscellaneous		Under maintenance by end of year under report	Newly started during year under report
	1 : 25,000		1-inch		½-inch		¼-inch		1-inch		½-inch		¼-inch		Helio		En-graved				Helio		En-graved													
	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)	(*a*)	(*b*)		
MAP PUBLICATION OFFICE																																				
1 Drawing Office—																																				
New Editions ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15	..	..	..	..	..	..	..	..	..	..	..	3	..	8	..	2	473	..
Reprints	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
NORTHERN DIRECTORATE																																				
1 Drawing Office—																																				
New Editions ..	..	..	..	14	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,123	27
Reprints	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6 Drawing Office—																																				
New Editions ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Reprints	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
EASTERN CIRCLE																																				
5 Drawing Office—																																				
(Including Engraving Office)																																				
New Editions ..	..	..	..	3	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	623	21
Reprints	..	..	3	..	..	..	..	..	..	..	..	..	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
SOUTHERN CIRCLE																																				
4 Drawing Office—																																				
New Editions ..	..	..	1	2	..	..	4	16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,012	9
Reprints	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
WESTERN CIRCLE																																				
3 Drawing Office—																																				
New Editions ..	..	..	3	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	926	27
Reprints	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TOTAL ..	..	..	7	20	..	..	4	21	..	..	..	..	3	1	..	..	..	15	..	..	..	..	..	..	..	..	..	..	..	3	..	8	..	2	4,157	84

XIII. WORK AND EQUIPMENT OF PRINTING OFFICES

227. **Photo-Litho Office, Hāthībarkala, Dehra Dūn.**—Besides printing the standard departmental maps, a large number of extra-departmental and commercial jobs were printed during the period under report, which included :—

(*i*) Maps, drawings and plans for development schemes like dam projects and canalization scheme, etc.

(*ii*) A large number of sketches for various Central Government departments.

(*iii*) Forest maps, weather charts and other large scale maps for the Central and State Government departments.

In addition to the above, National and School Atlases were also printed.

The following Printing Machines and Proving Presses were in use :—

Lithographic Printing Machines.—

One Crabtree Fully Automatic Quad Demy Single Colour Offset with H.T.B. Feeder.

One Crabtree Fully Automatic Quad Demy Double Colour Offset with H.T.B. Feeder.

One Crabtree Fully Automatic Double Demy Single Colour Offset with H.T.B. Feeder.

Five Crabtrees Fully Automatic Double Demy Double Colour Offset with H.T.B. Feeder.

One Mann "Fast Three" Fully Automatic Quad Demy Single Colour Offset with M.S. Feeder.

One Mann "Fast Five" Fully Automatic Quad Demy Double Colour Offset with M.S. Feeder.

One Mann Standard Double Demy Single Colour Offset (Hand-fed).

Two 'Baby' Manns Fully Automatic Single Colour Offset with H.T.B. Feeder.

One Harris Type L.S.B. Single Colour Offset with Automatic Feeder.

One Rota Print.

Lithographic Proving Presses.—

Seven Furnival Quad Demy Offset Proving and Duplicating Presses.

One Furnival Quad Crown Offset Proving and Duplicating Press.

One Furnival Double Demy Offset Proving and Duplicating Press (Hand-driven).

One Mann Quad Demy Deffa.

Two Double Elephant Proving Presses (Hand-driven).

One Double Elephant Litho flat-bed Proving Press (Hand-driven).

One Hoe Double Imperial Flat-bed Proving Press (Hand-driven).

Plate Making Machine.—

One Printed Junior "Step and Repeat" Machine.

228. **Photo-Zinco Office, Dehra Dūn.**—In addition to standard departmental maps, various maps for hydro-electric, irrigation and construction projects and maps of rainfall studies were also printed.

Thirty-two other ranks from the Corps of Engineers were trained in the various reproduction processes during the period under report.

The following Printing Machines and Presses were in use :—

Lithographic Printing Machines.—

Two Crabtrees Fully Automatic Double Demy Double Colour Offset with H.T.B. Feeder.

Two Crabtrees Fully Automatic Double Demy Single Colour Offset with H.T.B. Feeder.

One Mann Double Demy Single Colour Offset (Hand-fed).

Lithographic Proving Presses.—

One Mann Quad Demy Deffa Offset Proving Press.

Two Furnival Quad Demy Offset Proving and Duplicating Presses.

Two Furnival Double Demy Offset Proving and Duplicating Presses.

Two Mann Double Demy Offset Proving and Duplicating Presses.

Letterpress Printing Machines.—

Two Payne and Dawson, Double Crown Warfedale.

One Payne and Otley, Demy Warfedale.

One Furnival Platen $13\frac{1}{2}'' \times 8\frac{1}{2}''$.

One Walker Bros. Laurettee Platen-Half Super Royal.

One Harrild Art Platen Crown Brand Size $21'' \times 16''$.

Two Kalley No. 2 Printing Presses.

One Waite and Saville Otley Machine-Demy.

One British Vertical Press 13½″ × 20″.
Two Hand Presses 21″ × 29″.
One Hand Press 21″ × 16″.
Two Crosland Guillotine Machine.
One Hot Press with Iron Bar.
Four Monotype Composition and Casting Machines.
Four Monotype Keyboards.
One Bookbinder Nipping Press.
Two Perforating Machines.
One Millboard Cutting Machine.
One Blocking Press (Koh-i-noor).
One Harrild 4-Pillar Blocking Press, Model No. 1.
Two Wire Stitching Machines.
One Thread Stitching Machine Martine.
One Book Sewing Machine, Martine.
One Ruling Machine.
One Universal Punching and Eyeletting Machine.
One Book Rounding Machine.
One Book Backing Machine 20″ Wide.
One Harrild Rapid Book and Jobbing Folding Machine.
One Routing Machine, Royal Router No. 2.
One Stereo Casting Box.
One Harrild Electric Casting Box.
One Matrix Rolling Machine (Stereo Mangle Press).
One Harrild Compositors Proof Press 32″ × 16″.
One Harrild Speedy Proving Press, Double Crown.
One Stereo Foundry Hot Press.
One Combined Bench and Wall Drill Machine.
One Universal Plate Gauge.
One Harrild Hand Lever Card Cutting Machine.
One Round Corner Cutting Machine.
One Precision Trimming Machine.
One Saw Bench Stereo.
One Victory Matrix Beating Machine.
One Hunter Penrose Rotary Planing Machine.
One Harrild Galley Press for Proving Blocks.
One Roller Casting Outfit.
One Electric Metal Melting Pot New Funditor.
One Finishing Press.
One Gilding Press.

229. **Photo-Litho Office, Calcutta.**—In addition to the printing of standard departmental maps, a number of extra-departmental maps were also printed for various Central and State Government departments, commercial firms and the public. These included :—

(*i*) Maps for flood control, hydro-electric, irrigation construction projects, including bromide prints of photo mosaics.

(*ii*) Enlargements of topo maps.

(*iii*) Agmark Labels.

(*iv*) Miscellaneous forms for the Government of India Press and the Controller of Printing and Stationery.

(*v*) Illustrations of annual report for 1961 for the Chief Inspector of Mines.

(*vi*) Patent lists, drawings and sketches.

(*vii*) Illustrations for Government Epigraphist for India.

(*viii*) Maps for Tata Iron and Steel Company.

(*ix*) Bromide prints for Calcutta Metropolitan Planning Organization.

The following Printing Machines and Presses were in use :—

Lithographic Printing Machines.—

One Crabtree Fully Automatic Quad Demy Single Colour Offset with H.T.B. Feeder.

Two Crabtrees Fully Automatic Double Demy Single Colour Offset with H.T.B. Feeder.

One Crabtree Fully Automatic Double Demy Double Colour Offset with H.T.B. Feeder.

One Mann "Fast Three" Fully Automatic Quad Demy Single Colour Offset with M.S. Feeder.

Two Mann Double Demy Hand-fed Single Colour Offset with chute Delivery.

One Ratcliffe Quad Demy Flat-bed.

Lithographic Proving Presses.—

One Mann Quad Crown Offset Proving and Duplicating Press.

One Mann Quad Demy Offset Proving and Duplicating Press.

Two Mann Double Demy Offset Proving and Duplicating Presses (one Hand-driven).

One Furnival Double Imperial Proving Press.

Two Furnival Double Elephant Proving Presses.

One Greige Special Double Imperial Proving Press (Hand-driven).

One Mann Quad Demy Deffa.

Letterpress Printing Machines.—

One Linotype and Machinery Double Crown Centusette.

One Rockstorch and Schneider Victoria Demy Platen.

One Chander Price Foolscap Platen.

One (Hopkinson & Cope, Ltd.) Foolscap Size Hand Press.

PART III—GEODETIC WORK

XIV. ABSTRACT OF GEODETIC OPERATIONS

230. **General.**—Geodetic operations include miscellaneous computations and research, preparation and publication of records, observatory work (astronomical, magnetic, seismological and meteorological), measurement of geodetic bases, principal triangulation, geodetic levelling, determination of precise latitudes, longitudes, azimuths, gravity and prediction of tides at 39 ports between Suez and Singapore.

The following is a brief account of the geodetic operations carried out from 1st April 1962 to 31st March 1963.

231. **Base Measurement and Triangulation.**—The programme of base measurement and geodetic triangulation remained in abeyance due to demands for other priority assignments for various projects.

232. **Metrology.**—Lengths of 4-metre bars and 24-metre and 8-metre wires and 4-metre tape have been standardised on the 4-metre and 24-metre Comperators.

233. **Levelling.**—169 linear kilometres of high precision levelling was carried out in Himachal Pradesh, Punjab and Uttar Pradesh for the study of Tear-Faults for the Geological Survey of India.

158 and 362 linear kilometres of secondary levelling were carried out for Narmada Irrigation Project in Gujarāt and Indrāvati Project in Madhya Pradesh and Orissa respectively.

Precision levelling of 95 linear kilometres was carried out in Mysore and Goa to provide revised height at Marmagao Harbour for Naval Hydrographic Department.

234. **Gravity.**—Observations were carried out at 113 stations with Worden Gravimeter in the states of Madhya Pradesh, Punjab, Rājasthān and Uttar Pradesh in order to bring all the gravimetric stations established so far in terms of National Gravity Base Station at Dehra Dūn and accordingly adjust the entire gravity data in India.

235. **Geomagnetism.**—Magnetic observatory at Sabhāwāla (Dehra Dūn) has not yet started functioning. According to the recommendations of the Geophysics Research Board, magnetic observations were, however, carried out in other areas at Dehra Dūn for choosing an alternate site for magnetic observatory.

Observations in connection with detailed magnetic survey during the minimum sun-spot activity period in connection with World Magnetic Survey and International Quiet Sun Year (I.Q.S.Y.) programmes of International Geophysical Year (I.G.Y.) were taken at 306 field stations in Andhra Pradesh, Bihār, Goa, Mahārāshtra, Mysore, Orissa and West Bengal.

In this connection 13 repeat stations were re-occupied in the states of Andhra Pradesh, Bihār, Mahārāshtra, Mysore, Orissa and West Bengal.

The instruments were calibrated at the Alibag Observatory, before commencement of field work.

236. Astronomical observations in connection with the International Geophysical Co-operation (I.G.C.) Programme.—

Precise latitude and longitude observations were continued at the Dehra Dūn observatory on clear nights, twice a week throughout the year.

237. Tidal Work.—Tidal predictions for 39 ports between Suez and Singapore were carried out as usual at Dehra Dūn and Tide Tables were published. The automatic registration of tides at 14 ports was also carried out.

A new tidal observatory has started functioning at Bhaunagar with effect from 24th March 1963.

The touring tidal detachment carried out 31-day tidal observations at 4 secondary ports on the coast of Mahārāshtra and tidal streams detachment took short period current observations at 36 sites around Kandla Oil Jetty. Annual harmonic analysis of hourly heights were carried out for some ports.

238. Observatory and Workshop.—Siesmological and meteorological observations, calibrations, testing, repairs, adjustments, issue and receipt of survey instruments and maintenance of standard of length, clocks, optical and other precision instruments, etc., have been carried out as usual.

239. Computations and Publications.—Computations, scrutiny and adjustment of trigonometrical data, conversion and revision of tables into metric system and of data from spherical to grid and vice versa ; computations of topo data for publication of complete data pamphlets, reduction of levelling, gravity, magnetic and astronomical observations, designing of tables, forms, nomograms to air survey computations, study about projections and their applications, study about deviation of vertical, investigations into the effect of change of spheroid on computations, surveying and mapping, adjustment of levelling, etc., were carried out.

240. Technical Publications.—A number of High Precision and secondary levelling pamphlets, tide tables, tables in metric system, Auxiliary Tables for survey computations, gravity tables, and triangulation pamphlets were printed.

It is proposed to bring out revised edition of Technical Paper No. 10 (Gravity Data in India) in 4 volumes. Compilation of Volume I covering the area between latitude 28° N. to 36° N. and longitude 72° E. to 84° E. is in progress.

241. **Training.**—Training was given in geodetic and tidal computations and observations to both departmental and extra-departmental officers.

242. **Library and Museum.**—The Survey of India Library and Museum which are attached to this Branch, functioned as usual.

243. **Forms and Publication Section.**—Issue of technical and administrative forms, books, etc., was continued as usual. Action for printing of new forms and reprinting of old forms have been taken whenever necessary.

244. **Preservation and Maintenance of G.T. Stations and Primary Protected Bench-marks.**—The annual reports received from various District Officers, Executive Engineers and Forest Officers on the condition of G.T. stations and Primary Protected Bench-marks in their areas, were examined and action regarding their proper maintenance was taken.

245. An abstract of geodetic and geophysical surveys carried out in the states of the Indian Union is alphabetically arranged and given below :—

Andhra Pradesh.

Geophysical work.—Magnetic observations at 57 field stations and 1 repeat station (p. 163).

Bihār.

Geophysical work.—Magnetic observations at 52 field stations and 3 repeat stations (p. 164).

Goa, Damān and Diu.

Levelling of precision of line Kārwār to Marmagao (p. 160).

Geophysical work.—Magnetic observations at 4 field stations (p. 163).

Gujarāt.

Levelling of secondary precision of line Nadiād to Lilāpur (p. 159).

Oceanographic work.—Short period tidal streams observations at 36 sites at Kandla (p. 159).

Installation of an automatic tide-gauge at Bhaunagar (p. 159).

Himāchal Pradesh.

Levelling of high precision for study of Tear-Faults in Konch Dam area for Geological Survey of India (p. 160).

Madhya Pradesh.

Levelling of secondary precision of line Borigumma to Borai (p. 160).

Geophysical work.—Gravity observations at 28 stations (p. 164).

Mahārāshtra.

Geophysical work.—Magnetic observations at 5 repeat stations and 92 field stations (p. 163).

Oceanographic work.—Short period tidal observations at 4 secondary ports (p. 159).

Mysore.

Levelling of precision of line Kārwār to Marmagao (p. 160).

Geophysical work.—Magnetic observations at 1 repeat station and 53 field stations (p. 163).

Orissa.

Levelling of secondary precision of line Borigumma to Borai (p. 161).

Geophysical work.—Magnetic observations at 2 repeat stations and 28 field stations (p. 164).

Punjab.

Levelling of high precision for the study of Tear-Faults in Konch Dam area for the Geological Survey of India (p. 160).

Geophysical work.—Gravity observations at 6 stations (p. 164).

Rājasthān.

Geophysical work.—Gravity observations at 27 stations (p. 164).

Uttar Pradesh.

Levelling of high precision for the study of Tear-Faults in Konch Dam area for Geological Survey of India. (p. 160).

Geophysical work.—Gravity observations at 52 stations (p. 164).

Magnetic observations at Sabhāwāla (p. 164).

West Bengal.

Geophysical work.—Magnetic observations at 1 repeat station and 20 field stations (p. 164).

XV. TABLE C.—Areas, out-turns and cost rates of Geodetic Work

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per dett. per month	Cost rate		Remarks
				*Net	†Overall	
Tidal Party.—				Rs.	Rs.	**GEODETIC AND RESEARCH BRANCH.**
Creek with muddy and turbulent water	Tidal stream observations at Kandla	36 sites	13 sites	395·0 per site	764·0 per site	
Rocky and sandy	Tidal observations at 4 ports on the West Coast of India	4 ports	1 port	2,670·3 per port	4,553·2 per port	
No. 14 Party.—						
	Marmagao Harbour Project					
Partly flat and partly undulating	Precision Levelling	95·0	47·0	54·7	71·1	
	Study of Yamuna Tear-Faults					
Partly flat and partly undulating	Precision Levelling (back) ..	169·0	120·0	20·9	27·1	
	Narmada Irrigation Project					
Flat	Secondary Levelling	158·0	78·0	51·4	66·9	
	Indrāvati Project					
Partly flat and partly undulating with dense forest	Secondary Levelling	362·0	54·0	52·5	68·2	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

XV. TABLE C.—Areas, out-turns and cost rates of Geodetic Work

Party and description of country	Class of work (including scale and V.I.)	Area	Out-turn per dett. per month	Cost rate		Remarks
				*Net	†Overall	
No. 19 Party.—				Rs.	Rs.	**GEODETIC AND RESEARCH BRANCH.—*Concld.***
Partly undulating and partly plain	Gravity observations	113 (stations involving 16 connections)	76 stations	90·4 per station	117·5 per station	
	Magnetic Surveys					
	Detailed magnetic surveys in connection with World Magnetic Surveys (W.M.S.) and International Quiet Sun Year (I.Q.S·Y.)	13 repeat stations and 306 field stations	115 stations	82·2 per station	106·9 per station	

* Net cost represents the expenditure actually incurred on the work plus party overhead charges.
† Overall cost is the net cost plus the cost incurred on moving the party to and from the field and departmental overhead charges.

XVI. SURVEY REPORTS, GEODETIC AND RESEARCH BRANCH

PRESIDENT:—*In abeyance.*

DEPUTY DIRECTOR:—Lt.-Colonel K. L. Khosla, B.Sc., B.E. (Civil), A.M.I.E., M.A.S.C.E. (U.S.A.), Engineers.

246. **Summary.**—The Geodetic and Research Branch comprises of Computing, Tidal, Nos. 14 and 19 Parties.

247. **General.**—The Branch deals with the geodetic and geophysical activities of the department. The functions are :—

Provision of precise framework to control topographical, cadastral and engineering surveys. This involves geodetic operations of base measurement, triangulation, traverse, astronomical observations, high precision and secondary levelling, magnetic, gravity and tidal observations and the elaborate computations accompanying them.

Pari-passu with the above operations, provision of valuable scientific data for studies of the figure, shape and structure of the earth and for studies of various geophysical problems such as the magnetic and gravity fields of the earth, subsidence of land, steric rise of sea-level, isostasy, crustal movements, atmospheric refraction, etc.

Making use of the available scientific data for various utilisation purposes in the country, such as determination of mean sea-level, tidal predictions and current surveys for shipping, magnetic tables and charts for land, sea and air navigation, gravity tables and charts. This scientific work is vitally needed and utilised also by several other departments such as the Meteorological Dept., Geological Survey of India, Public Works Departments, various Ministries of the Government of India, Indian Bureau of Mines, Oil and Natural Gas Commission, the Indian Navy, Civil Aviation and the Shipping Department, etc.

Preparation of technical reports and other technical and professional papers, auxiliary tables for projection of maps, grids and for other purposes ; designing of computation forms ; adjustment of both geodetic and topographical triangulation and other survey data ; preparation of pamphlets giving triangulation and levelling data and editing and proof reading of technical publications of the department.

Maintenance of all geodetic and exploration survey records of the department and issue of all types of data.

Training of departmental and extra-departmental officers in observations and computational techniques. Designing, repairing, testing and calibration/standardisation of precise survey instruments.

This Branch is also responsible for the work of the tidal office, which prepares and publishes annual tide tables of the Indian Ocean containing predictions of time and heights of high and low waters at 39 ports between Suez and Singapore.

This Branch further deals with the designing, preparation, and examination of draft specifications of surveying instruments for the Indian Standards Institution.

At present this Branch is mostly engaged on provision of precise control required for multipurpose project surveys for the 5-Year Plans. The International Geophysical Year, International Geophysical Co-operation, Indian Quiet Sun Year, International Indian Oceanic Expedition and World Magnetic Survey programmes, on latitude variations, tidal observations, geomagnetism, gravity and glaciology have also been taken up.

Research work in so far as it concerns our activities is carried *pari-passu* with productive work in geodesy and allied subjects and is a continued process. This research work has been organised on a collective basis, not in the nature of pure or fundamental research, but as applied research for improving the methods of geodetic, geophysical and topographical surveying including the observational techniques and computations. This also includes the collection of data and their continuous review and study of significant trends and developments with a view to achieving maximum accuracy consistent with economy and efficiency.

A detailed narrative of the work carried out by the units during the period under report is given in the following pages.

COMPUTING PARTY

Officer in charge :— Lt.-Colonel K. L. Khosla, B.Sc., B.E. (Civil), A.M.I.E., M.A.S.C.E. (U.S.A.), to 22-4-62.
Shri V. Rangan, M.A., from 23-4-62 to 25-8-62.
Major D. P. Hajela, B.E. (Civil), Engineers, from 26-8-62 to 31-10-62.
Shri A. N. Ramanathan, M.A., A.R.I.C.S., A.M.I.S., from 1-11-62.

248. General.—The headquarters of the party remained at Dehra Dūn (U.P.) throughout the period under report.

The unit was primarily engaged on the following tasks :—

(*a*) Conversion and revision of Auxiliary Tables into metric system.

(*b*) Computations, adjustment and compilation of topographical data for publication of Complete Data Pamphlets.

(*c*) Adjustment of topographical triangulation data, in terms of G.T. data.

(*d*) Computations of map projection data.

(*e*) Supply of data of triangulation, levelling to departmental and extra-departmental indenters.

(*f*) Assessment of accuracy of topo data.

(*g*) Proof reading of different publications.

(*h*) Training of Computers.

(*i*) Drawing of various charts and diagrams for different technical publications.

(*j*) Amendment of professional forms.

(*k*) Preservation and maintenance of G.T. stations and Primary Protected bench-marks.

(*l*) Maintenance of geodetic and other survey records.

249. **Personnel.**—The average strength of the Party was 1 Class I Officer, 1 Class II Officer, 3 Survey Assistants, 1 Scientific Assistant, and 47 other Class III personnel including Clerks.

250. **Recess Work.**—The personnel were mainly employed on the following tasks :—

(*a*) *Computations and Compilation.*—

(*i*) Conversion and revision of Auxiliary Tables, Part III (Topographical Survey Tables) into metric system.

(*ii*) Adjustment of topo triangulation data in sheets 40 H, 41 A and 41 E.

(*b*) *Charts.*—Drawing of charts showing gravity stations in India ; National Report 1962, (International Union of Geodesy and Geophysics) (I.U.G.G.) work ; astronomical nomograms (Polar motion) G.T. Triangulation Series in India, Tidal stations and Principal lines of levelling on 40-mile maps (grey prints) of India.

(*c*) *Training.*—20 Trig. Computers and 3 Topo Trainees, Type 'B' (Computers) were imparted training in departmental computations.

(*d*) *Records and Supply of Data.*—Maintenance of records of Geodetic triangulation, traverse, levelling and other observations of astronomical, gravity, magnetic, etc., were carried out. Also the assessment of accuracies of topo data as well as the compilation and supply of Trig. and levelling data to both departmental and extra-departmental indenters were attended to as usual.

(*e*) *Preservation and Maintenance of G.T. Stations and Primary Protected Bench-marks.*—Annual reports on the condition of about 3,000 G.T. Stations and 2,000 Primary Protected Bench-marks were received and examined.

Repairs were scheduled to be carried out to about 127 G.T. Stations and 17 Primary Protected Bench-marks.

The P. & M. Section dealing with this work was transferred to No. 14 Party, w.e.f. 19th December 1962.

TIDAL PARTY

Officer in charge :— Shri A. N. Ramanathan, M.A., A.R.I.C.S., A.M.I.S., to 1-6-62 and again from 30-7-62 to 3-1-63.
Shri V. Rangan, M.A., from 2-6-62 to 29-7-62 and again from 4-1-63.

251. General.—The headquarters of the party remained at Dehra Dūn (U.P.) throughout the period under report.

The Party, comprising of two sections, viz., Tidal and Observatory (Astronomical Section having gone under the direct control of the Deputy Director, Geodetic & Research Branch, with effect from 1st January 1963), carried out the following tasks :—

(*a*) *Tidal Section.*—

(*i*) Prediction of tides at 39 ports between Suez and Singapore and publication of the tide tables.

(*ii*) Prediction of tides at 16 secondary ports on the coast of Mahārāshtra, for the year 1963.

(*iii*) Automatic registration of tides at 14 ports.

(*iv*) Installation of an automatic tide-gauge (Newman's pattern) in the newly constructed cabin at Bhaunagar, south of concrete jetty.

(*v*) 31-day tidal observations at 4 secondary ports.

(*vi*) Tidal stream observations at 36 sites around Kandla oil jetty, with Robert's current-meter and their subsequent reductions in the headquarters.

(*vii*) Harmonic analyses and investigations.

(*viii*) Supply of tidal information to indenters.

(*ix*) Supply of Mean Sea-Level data to the Permanent Service for the Mean Sea-Level, Birkenhead, England.

(*x*) Compilation of data for the "Indian Tide Tables, Part II" and for the proposed publication to be entitled "Addendum to the Coastal Bench-marks Pamphlet".

(*xi*) Training of personnel in tidal work.

(*b*) *Observatory Section.*—

(*i*) Comparison and maintenance of standards of length.

(*ii*) Calibration of various instruments.

(*iii*) Test, repairs and adjustment of survey instruments.

(*iv*) Issue and maintenance of optical and precision instruments.

(*v*) Routine meteorological observations.

(*vi*) Maintenance of observatory instruments.

252. **Personnel.**—The average strength of the personnel was 1 Class I Officer, 1 Class II Officer, 3 Surveyors, 3 Scientific Assistants, 1 Geodetic Computer, 3 Survey Assistants and 35 other Class III personnel including 4 Clerks and 9 Instrument Mechanics.

253. **Areas Surveyed.**—Short period tidal observations at 4 secondary ports on the coast of Mahārāshtra and Tidal stream observations at 36 sites at Kandla in Gujarāt.

254. **Recess Work.**—

A. Tidal Section.

(*a*) *Tide Tables.*—

(*i*) The Indian Tide Tables and the four separate pamphlets for the port of Kandla, the port of Bombay, the Hooghly River and the Rangoon River for the year 1963, were published.

(*ii*) Advance predictions for 17 ports for the year 1964 were despatched to the Hydrographic Departments of the U.S.A., U. K. and Japan and also to the Liverpool Tidal and German Hydrographic Institutes and the Indian Navy, in accordance with the standing arrangements. Predictions for 1964 in respect of the remaining ports as well as advance predictions for 1965 for certain ports, are in hand.

(*iii*) Tidal predictions for 1963 for 16 secondary ports in Mahārāshtra were also carried out and supplied to the Chief Port Officer, Mahārāshtra State.

(*b*) *Analyses and Investigations.*—

(*i*) Intensive analyses, by the method of Liverpool Tidal Institute, of one full year's observations of the following ports were completed for the years indicated in brackets :—

Marmagao (1885–86), Bombay (1920) and Vishākhapatnam (1961).

(*ii*) Harmonic analyses of 31-day tidal observations taken by the touring tidal detachment at the following ports, were completed by the Liverpool Tidal Institute's extended method, central dates of analyses being given in brackets :—

Vengurla (C.D. 12-11-61), Āchra (C.D. 16-12-61), Devgarh (C.D. 18-1-62), Musākazi (C.D. 20-2-62), Purangad (C.D. 26-3-62), Tiwāri (C.D. 30-4-62). Field computations of 4 secondary ports, observed during the period under report, are in hand.

(*iii*) 15-day tide-pole observations carried out by the Indian Navy in April 1961 at Palk Bay and Gulf of Manar have been analysed and the results supplied.

(*iv*) Tidal stream observations taken at Kandla, with the Roberts' current-meter, during the monsoon of 1962, have been computed and the results supplied to the Development Commissioner, Kandla Port.

(*v*) Non-harmonic analyses of two days' tidal stream observations at two sites in Okha, carried out by the Hydrographic Department of the Indian Navy have been completed and the results supplied to the Chief Hydrographer.

(*vi*) Computations for assessing the accuracy of tidal predictions for 1962, are in hand.

(*vii*) Computations of monthly Mean Sea-Levels, from hourly heights were carried out for the following ports for the periods indicated in brackets :—

Bombay (Apollo Bandar) (Jan. to Sept. 1962), Mangalore (Jan. to June 1962), Vishākhapatnam (Jan. to Oct. 1962), Sāgar (Jan. to May 1962), Diamond Harbour (1962), Garden Reach (Jan. to May 1962), Tribeni (1962).

(*viii*) Monthly Mean Tide-Levels of all ports, where tide-gauges and tide-poles are functioning, were computed for the year 1962.

(*c*) *Miscellaneous.*—

(*i*) Hourly heights of tide-levels were read off the tide-gauge diagrams of the following ports for the year indicated in brackets :—

Kandla (Jan. to Sept. 1962), Verāval (1962), Bombay (Appollo Bandar) (1962), Mangalore (Jan. to Oct. 1962), Cochin (1961), Madras (1962), Vishākhapatnam (1962), Sāgar (Jan. to May 1962), Diamond Harbour (1962), Garden Reach (1962), Rangoon (1961), Port Blair (Jan. to Sept. 1962).

(*ii*) Monthly and annual Mean Sea-Level data up to and including 1961, for all ports, where automatic tide-gauges are functioning, have been supplied to the Permanent Service for the Mean Sea-Level, England.

(*iii*) Coastal Levelling data are under compilation for inclusion in the proposed addendum to the Coastal Bench-Marks Pamphlets.

(*iv*) Compilation of the harmonic constants for the various primary and secondary ports for which fresh analyses have been done, is in hand, for supply to the International Hydrographic Bureau.

(*v*) New tide-gauge diagram in metric system was devised and printed for the automatic tide-gauge at Cochin.

B. Observatory Section.

(*a*) *Repairs, test and calibrations of instruments.*—During the period under report 114 instruments of various kinds were tested, 416 instruments were calibrated and 868 instruments were repaired.

The 42-component Tide Predicting Machine, photogrammetric equipments, astronomical instruments, clocks, wireless sets, etc., were repaired from time to time and kept in working order.

(*b*) *Routine Work.*—Daily meteorological observations and supply of weather data, upkeep and storage of optical and other precision instruments, procurement and allotment of all precision instruments for the Department and issue of instruments to various field detachments of this Branch, formed part of the routine work.

255. **Field Work.**—

(*a*) Roberts' current-meter of Kandla Port authorities was checked and test observations were carried out in the Kandla Creek.

(*b*) One detachment carried out short period tidal stream observations at 36 sites in Kandla.

(*c*) An automatic tide-gauge (Newman's pattern) was installed at Bhaunagar and the bed plate was connected by vertical angle method.

(*d*) One detachment carried out 31-day tidal observations at each of the secondary ports of Boria, Palshet, Harnai and Srivardhan on the Mahārāshtra coast.

(*e*) Automatic tide-gauge registrations were continued at Kandla, Verāval, Bhaunagar, Bombay (Apollo Bandar), Mangalore, Cochin, Madras, Vishākhapatnam, Sāgar, Diamond Harbour, Garden Reach, Tribeni, Port Blair and Rangoon. Break of observations occurred at Kandla and Mangalore for long periods, the former due to part of the float well having collapsed and the latter due to defects in the float and float well. However, tide-pole observations were continued by the local authorities while the tide-gauges remained out of action.

Tide-pole observations of high and low water during day and night were continued at Bhaunagar Concrete Jetty by the Port authorities.

Daylight visual observations of high and low water were taken at Amherst and Moulmein by the Port authorities.

256. **Description of Country.**—The tidal work was carried out along the coastal strip of Mahārāshtra State and in the Kandla Creek in Gujarāt.

257. **Miscellaneous.**—The health of the personnel remained good throughout the period under report.

No. 14 PARTY

Officer in charge :— Shri R. M. Gupta, M.Sc., to 22-1-63.
Shri A. K. Bhattacharjee, B.Sc. (Hons.), from 23-1-63.

258. **General.**—The office work of the party consisted of computations of high precision, precision and secondary levelling, preparation of press copies of levelling pamphlets, examination of proofs of levelling pamphlets, supply of levelling data to departmental and extra-departmental indentors and training of officers in levelling.

The field work consisted of high precision, precision and secondary levelling in Goa, Gujarāt, Madhya Pradesh, Mysore, Orissa, Punjab and Uttar Pradesh.

The headquarters of the party remained at Dehra Dūn (U.P.) throughout the period under report.

259. **Personnel.**—The average strength of the party was 1 Class I Officer, 5 Class II Officers, 7 Surveyors, 1 Survey Assistant, 3 Geodetic Computers and 24 other Class III personnel including 4 Clerks.

260. **Areas Surveyed.**—

169·0 linear km of high precision levelling for Konch Dam (one direction).

95·0 linear km of precision levelling for Marmagao Harbour.

520·0 linear km of secondary levelling for various irrigation projects.

261. **Field Work**—The following levelling was carried out during the period under report.—

(*a*) *Levelling of High Precision.*—169 linear km (back direction only) of line from Dehra Dūn to Saharanpur in Uttar Pradesh, Himāchal Pradesh and Punjab for study of Tear-Faults in Konch Dam area for Geological Survey of India. The levelling in fore direction was carried out in 1961-62.

(*b*) *Levelling of Precision.*—95 linear km (in both directions) of line Kārwār to Marmagao in Mysore and Goa to provide height of Bench-marks at Marmagao Harbour for Naval Hydrographic Department.

(*c*) *Levelling of Secondary Precision for Extra-departmental Indentors.*—

(*i*) 158·0 linear km for Narmada Irrigation Project in Gujarāt,

(*ii*) 362·0 linear km for Indrāvati Project in Madhya Pradesh and Orissa.

262. Recess Work.—The party was organised into two sections and carried out the following tasks :—

(*a*) Computations of all precision/secondary levelling executed during field season 1961-62.

(*b*) Supply of triangulation and levelling data to the departmental and extra-departmental indenters.

(*c*) Conversion of distances and heights in metric system of precision levelling pamphlets sent for reprinting.

(*d*) Preparation of press copies of precision and secondary levelling pamphlets for printing and examination of proofs, etc., thereof.

(*e*) Revision of Topo Handbook Chapter III in metric system.

Preservation and Maintenance Section was transferred to this Unit w.e.f. 19th December 1962 and action regarding preservation and maintenance of G.T. Stations and P.P. Bench-marks was taken as usual (also see para 250 under Computing Party).

263. Description of Country.—The area of field work for Geodetic triangulation is mostly flat with small hillocks in Punjab and hilly in Himāchal Pradesh and Punjab.

Goa and Mysore.—The area for precision levelling in these states is partly flat and partly undulating and hilly.

Himāchal Pradesh and Uttar Pradesh.—High Precision levelling for study of Yamuna Tear-Faults was carried in the area partly flat and partly undulating.

Gujarāt.—Secondary levelling for Narmada Project runs in flat area.

Madhya Pradesh and Orissa.—Area for secondary levelling for Indrāvati Project is partly flat and partly undulating/hilly with dense forest.

264. Miscellaneous.—The health of the personnel remained good throughout the period under report.

No. 19 PARTY

Officer in charge :—
- Shri R. M. Gupta, M.Sc., to 19-8-62 and from 1-11-62 to 28-11-62.
- Major D. P. Hajela, B.Sc., B.E. (Civil), A.M.I.E., Engineers, from 20-8-62 to 31-10-62 and from 23-1-63.
- Shri V. K. Nagar, M.Sc., from 29-11-62 to 21-12-62.
- Major G. C. Agarwal, B.E. (Civil), Hons. M.Sc. Ph.E. (I.T.C.), A.M.I.E., Engineers, from 22-12-62 to 22-1-63.

265. General.—The headquarters of the party remained at Dehra Dūn (U.P.) throughout the period under report.

The party was engaged on the following tasks :—

(*i*) Magnetic Observations in the states of Andhra Pradesh, Bihār, Goa, Mahārāshtra, Mysore, Orissa and West Bengal.

(*ii*) Gravimetric connections in the states of Madhya Pradesh, Punjab, Rājasthān and Uttar Pradesh.

(*iii*) Checking of computations of H.F., V.F. and Declination observed in season 1961-62.

(*iv*) Computations of various gravity anomalies.

(*v*) Supply of Magnetic and Gravity data.

(*vi*) Training of Topo Trainees Type 'B' (Computers).

(*vii*) Repair of non-precision instruments in the general workshop.

266. Personnel.—The average strength of the party was 2 Class I Officers, 2 Class II Officers, 1 Geodetic Computer, 3 Survey Assistants and 51 other Class III personnel including 17 Carpenters/ Artificers and 5 Clerks.

267. Areas Surveyed.—

(*a*) *Magnetic.*—

(*i*) Andhra Pradesh	..	1 repeat station and 57 field stations.
(*ii*) Bihār ..	..	3 repeat stations and 52 field stations.
(*iii*) Goa ..	..	4 field stations.
(*iv*) Mahārāshtra	..	5 repeat stations and 92 field stations.
(*v*) Mysore ..	..	1 repeat station and 53 field stations.
(*vi*) Orissa ..	..	2 repeat stations and 28 field stations.
(*vii*) West Bengal	..	1 repeat station and 20 field stations.

(*b*) *Gravity.*—

(*i*) Madhya Pradesh	..	2 gravimetric connections.
(*ii*) Punjab ..	..	6 ,, ,,
(*iii*) Rājasthān ..	..	2 ,, ,,
(*iv*) Uttar Pradesh	..	6 ,, ,,

268. Recess Work.—The following tasks were undertaken during the period under report :—

(*a*) *Computations.*—(*i*) Magnetic Observations carried out during 1961-62 in respect of H.F., V.F. and Declination were computed and scrutinised. Values at field stations observed during I.G.Y./I.G.C. period were reduced to Epoch 1960·0 and compiled.

(*ii*) Estimation of heights was carried out for 734 stations and computations for isostatic and modified Bouguer anomalies were done for 436 stations, out of which 28 were located in Bihār, 281 in Madhya Pradesh, 21 in Uttar Pradesh and 40 in West Bengal. Free Air anomalies were also computed for 390 stations in Madhya Pradesh.

(*iii*) It is proposed to bring out a revised edition of Technical Paper No. 10 (Gravity Data in India) in 4 volumes. Compilation of Volume I (covering the area between latitude 28° N. to 36° N. and longitude 72° E. to 84° E.) is in progress.

(*b*) *Training.*—Training in survey computations was given to 16 Topo Trainees, Type 'B' of which 4 were from Western Circle, 4 from Southern Circle, 1 from Eastern Circle and 7 from Geodetic and Research Branch.

(*c*) *Supply of data.*—Magnetic and gravity data were supplied to the departmental and extra-departmental indentors.

(*d*) *Workshop.*—Job orders from various units for repair of non-precision instruments were received and attended to in the general workshop.

269. Field Duties.—

(*a*) *Magnetic.*—To enable completion of magnetic survey of the country by 1965 as a contribution to the World Magnetic Survey (W.M.S.) and International Quiet Sun Year (I.Q.S.Y.) programmes, two detachments each equipped with a set of Quartz Horizontal Magnetometer (Q.H.M.) and Zero Magnetometric Balance (B.M.Z.), carried out the field work in continuation of last season's work. The instruments were calibrated at Alibāg against the observatory standards before the commencement of the field work and one set of instruments was also calibrated against the same standards, after completion of the field work to check up if there were any variations. No appreciable variations were however found.

The first magnetic detachment under the charge of Shsi T. R. Joshi, Trig. Computer carried out observations for the Horizontal Force, Vertical Force and Declination at field stations about 40 miles apart. The same observations were also carried out for all the repeat stations in the area of work. Besides this, at field stations about 20 miles apart, observations for Vertical Force only were carried out with a set of Watt's Vertical Force Variometers. In all, 206 field stations, i.e., 57 in Andhra Pradesh, 4 in Goa, 92 in Mahārāshtra and 53 in Mysore, were established. In addition, 7

repeat stations, i.e., 1 in Andhra Pradesh, 5 in Mahārāshtra and 1 in Mysore were reoccupied.

The second magnetic detachment, under the charge of Shri Jeevan Lal, Geodetic Computer carried out magnetic observations for Horizontal Force, Vertical Force and Declination at field stations about 40 miles apart, and also reoccupied all the repeat stations falling in the area of work. As this detachment was not equipped with Vertical Force Variometers, field stations at 20 miles interval for Vertical Force only, were not observed. In all, 100 field stations, i.e., 52 in Bihār, 28 in Orissa and 20 in West Bengal were established. In addition, 6 repeat stations, i.e., 3 in Bihār, 2 in Orissa and 1 in West Bengal were reoccupied.

(*b*) *Gravity.*—A gravity detachment under Shri K. S. Namdhari, Trig. Computer carried out 16 gravimetric connections (observing a total of 113 stations in the states of Madhya Pradesh, Punjab, Rājasthān and Uttar Pradesh) amongst different existing gravimetric series. This was done with a view to bring all the gravimetric stations established so far, in terms of our National Gravity Base Station at Dehra Dūn and accordingly to adjust the entire gravity data in India.

270. **Description of Country.**—Western parts of Andhra Pradesh and northern parts of Mysore comprise of small hillocks with limited cultivation, while other areas are cultivated plains. Nature of the country in Mahārāshtra State varies from plain cultivated lands to densely forested hills of the western ghats. Except for the Mahanadi delta and the coastal belt of cultivated plains, the remaining areas of Orissa are mainly densely forested hills. South Bihār comprises of densely forested hills, while the Gangetic basin is cultivated plains. West Bengal consists of open flat plains with intensive cultivation.

Most of the roads in Andhra Pradesh and Mahārāshtra are unmetalled, while those in Mysore and Orissa are well maintained. Many rivers are unbridged in Bihār and West Bengal.

271. **Miscellaneous.**—The health of the personnel remained good throughout the period under report.

INDEX MAPS

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B. Modern Topographical Surveys and Revision (1-inch, $\frac{1}{2}$-inch and 1 : 50,000 scales) by 10-year periods from 1905.

C. Project Surveys in hand.

D. Maps published on 1-inch and $\frac{1}{2}$-inch scales.

E. Maps published on $\frac{1}{4}$-inch scale.

F. Carte Internationale du Monde Series, 1 : M scale.

G. Southern Asia Series, 1 : 2 M scale.

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