chapter = 3

profile of study

units
Profile of Hindustan Aeronautical Limited

I - Origin and Growth of HAL

The history of the Indian Aircraft Industry can be traced to the founding of Hindustan Aircraft Limited at Bangalore in December 1940 in association with the erstwhile princely State of Mysore and late Shri Seth Walchand Hirachand, an Industrialist of extra-ordinary vision. Govt. of India became one of its shareholders in March 1941 and took over the management in 1942. Hindustan Aircraft Limited was merged with Aeronautics India Limited and Aircraft Manufacturing Depot, Kanpur to form Hindustan Aeronautics Limited (HAL) on 01st October 1964.

HAL has engaged & succeeded in number of R & D programs for both the military and civil aviation sectors. Substantial progress has been made in the current projects like Dhruv -Advanced Light Helicopter (ALH), Tejas-Light Combat Aircraft (LCA), Intermediate Jet Trainer (IJT) and various military and civil upgrades. The deliveries of Dhruv were effected to Indian Army, Navy, Air Force and Coast Guard in March 2002, in its first year of production, which is a unique achievement.

The Company has made significant improvement in its overall performance and recorded an all time high turnover and profit of Rs 373 crs, respectively. The company delivered the first batch of indigenously designed and produced Advanced Light Helicopter (DHRUV) to the Indian Defence Services and Coast Guard. First batch of upgraded MIG - 21 BIS Aircraft was delivered to IAF during the year under review.

The first upgraded HS 748(Avro Aircraft) was delivered to IAF after evaluation by ASTE in record time.
Pegasus engine Test Bed designed and developed by company Engine and Test Bed R&D Center (ETBRDC) for Indian Navy was successfully commissioned and handed over to the customer.

The company continues to have the highest credit rating both from ICRA and CRISIL for long term and short-term debt programmes.

Today HAL has got 16 production units and 9 research and design centres spread out in seven different locations in India. Its product track record consists of 12 types of aircraft from in house R &D and 13 types by license production. HAL has so far produced over 3300 aircraft, 3400 Aeroengines and overhauled over 7700 aircraft and 26000 engines. HAL has played a significant role for India's space programs in the manufacturing of satellite launch vehicles like PSLV (Polar Satellite Launch Vehicle), GSLV (Geo Stationary Launch Vehicle), IRS (Indian Remote Satellite) & INSAT (Indian National Satellite).

HAL has also two joint venture companies, BAeHAL Software Limited and Indo-Russian Aviation Limited (IRAL). Apart from the two, other major diversification projects are Industrial Marine Gas turbine and Airport Services. Several co-production and joint Ventures with international participation are under consideration. BAeHAL Software Ltd. registered a turnover of Rs. 13.93 crores for the year 2001-2002, as against Rs.12.26 crs. In previous year and profit of Rs. 3.11 crores against Rs. 2.4 crores of previous year. The Board of Directors of the Company has recommended dividend payment of 5% on the paid-up share capital of the company.

The Indo-Russian Aviation Limited has shown significant increase in turnover at Rs. 152.46 crores during the year 2001-2002 as against Rs. 48.37 crores in the previous year. The company has earned a profit of Rs. 3.66 crores and the Board Of Directors has recommended a dividend payment of 25% of the paid-up share capital.
HAL's supplies / services are mainly to Indian Defence Services, Coast Guard and Border Security Force. Transport aircraft and Helicopters have also been supplied to Airlines as well as State Governments of India. The Company has also achieved a foothold in export in more than 30 countries, having demonstrated its quality and price competitiveness.

**Awards**

HAL has won several International & National Awards for achievements in R&D, Technology, managerial performance, exports, energy conservation, quality and fulfillment of social responsibilities. M/S Global Rating, United Kingdom in conjunction with The International Information and Marketing Center (IIMC) has awarded the “International gold medal award” at the International Summit (global rating leaders 2003) London, UK to M/s. Hindustan Aeronautics Limited for Corporate Achievement in Quality and Efficiency. HAL was also presented the International “Arch of Europe” Award in gold category in recognition for its commitment to Quality, Leadership, technology & Innovation. At National level, HAL won the top award instituted- by SCOPE (Standing Conference of Public Enterprises) -The “Gold trophy” for excellence in Public Sector Management.

The Company scaled new heights in the financial year 2002-2003 with a turn over of Rs. 3120 Crores and export of Rs. 103.89 Crores. The Company's steady organizational growth over the years with consolidation and enlargement of its operational base by creating sophisticated facilities for manufacture of aircraft / helicopters, aeroengines, accessories and avionics.

The corporate management of Hindustan Aeronautics Limited, way back in August 1969, established HAL Management Academy (HMA). The primary purpose of HMA is to transform practicing managers into leaders who will face managerial challenges resourcefully.
Management Development Programs At HMA

The Programs conducted at HMA are broadly categorized into general, functional and modular Programs that are structured to ensure maximum effectiveness. Certain programs, like NLP, provide opportunity for experiential learning in the classroom. Action learning is imparted in the wilderness through outbound training.

Some program themes like Visionary Thinking through Ethics & Values, Transformational Leadership to Influence Organizational Culture and Corporate Governance based on Indian ethos, Knowledge Management for Competitive Advantage in the dynamic Environment, Creativity & Innovation for Corporate Excellence, Supply Chain Analysis & Restructuring for Value Addition, Patenting & Intellectual Property Rights, QFD & Designing for Manufacturability, Six Sigma Breakthrough Business Strategy for Sustained Success, Influencing the Outcome of Situations Through Application of NLP, Financial Engineering and Managing in the IT Age.

HMA continuously reviews and modernizes its knowledge delivery systems to add value to the services offered by it. A balanced mix of training methods is used in the Programs. Interactive learning is supplemented with case studies, syndicate work, role-plays, management games, computer simulated business experiences, outbound training, book reviews, panel discussions and project work. Through project work, the participants gain experiential learning that they can transfer to workplace. Outbound training provides them opportunities for transformation to become effective leaders and team players.

Tools for training effectiveness

Diagnostics, experience sharing, action planning and learning diary help in enhancing the effectiveness of learning. Diagnostics exercise enables participants to identify difficulties faced in the work-place and helps them to
look for solutions during the program. The Learning Diary helps participants identify key learning points. Individual and group action plans are the means for transferring learning from the classroom to the workplace.

**Faculty**

In addition to highly qualified and experienced in-house faculty, HMA brings in expert visiting faculty from Indian Institutes of Management, Indian Statistical Institute, Administrative Staff College of India, Indian Institutes of Technology, Indian Institute of Science and other reputed management development organizations in the country. Practicing line managers from HAL and other industries as well as other trainers / consultants are also invited as visiting faculty.

**Human Resources**

1) Manpower planning

Out sourcing of low tech and medium tech jobs, fresh induction only in critical / highly specialized areas based on requirements due to increase in workload and super annuation profile (Annexure-II). In the Workmen Cadre, induction will be restricted to Direct Workmen only.

Improving the existing qualification profile by focusing induction of professionally qualified personnel and diploma holders.

Hence focus of recruitment would be to recruit people with combination of knowledge, skill, experience and attitude in line with organizational requirements through appropriate manpower plan (FOS) both short term (contract appointments) and long-term recruitment programme.

2) Training & development

Training is one of the most important interventions for developing human resource. Hence, identification of training competency profile in terms of vision, mission of the Company would be the strategic point of the training and development strategy of the Company.
III) Performance appraisal

Appraising people for meeting Company's goal would be the prime focus of performance management. The new Performance Appraisal System based on work planning and commitment (mutually agreed tasks), self review and performance analysis, performance review and feedback would ensure that the focus would be on value adding activities rather than on routine activities which bear no relationship with organizational goals and objectives. Identification of low performers and resultant corrective action throughout the company would be given priority. Similarly, faster career growth opportunity would be provided to high performers.

IV) Reward system

Focus of the reward system in the Company would be to promote teamwork and culture of achievement and excellence in the organization. In addition to the mechanism of individual reward for making exemplary contribution in the key thrust area of the Company for overall excellence and for desirable attributes like creativity and innovation. Coupled with above, schemes like "Inter Divisional Competition" and proposed "Profit Sharing Schemes" etc. has been institutionalized in the Company for team reward.

V) Scheme for learning & certification for executives

A "Learning Organization" is essential for survival in the present era of Liberalization, Privatization and Globalization. Therefore, "Knowledge" is the only Core Competence of Organizations for coping with changes.

In line with the above philosophy, among other initiatives like institutionalizing Learning Centres in Divisions etc., HAL has also introduced the Scheme for Learning & Certification for executives as a starting point for building individual knowledge. The Scheme inter-alia provides opportunity for the Junior & Middle Management Cadre Executives to broaden their perspective by not only learning about all functions and procedure in their respective disciplines but also in related areas and overall knowledge about the organization and its environment. So far, approximately, 45% (both for
"O" & "A" level) of executives have been certified (Annexure IV). It is proposed to expand the coverage of this Scheme further, if required, by linking the Scheme to some kind of Reward mechanism.

Lastly, HRD Plan will also include time-to-time OD Interventions to address specific requirements of the Company.

The company continues to benefit from the high quality of its work force that remained motivated. The company has taken several measures to rationalize and contain manpower strength such as development of multi-skills, outsourcing, and technology up gradation. However, in order to retain skills and to handle additional workload, recruitment is resorted to only in specific and specialized areas. The manpower strength on 31st march 2002 was 31652 as against 32642 as on 31st march 2001, thus a reduction of 990 has been achieved during the year.

**Productivity**

With a view to encouraging further improvement in productivity and quality a scheme for Inter-Divisional Performance Competition was introduced in the company during 2001-2002. This was to inculcate healthy competition among divisions. The introduction of the scheme was motivated the divisions to put in their best efforts to improve their all-round performance in respect of physical, financial and other parameters. Hindustan Aeronautics Limited maintained the trend of growth during the financial year 2002 - 2003 and achieved all - time sales, profits and exports. The turnover for the year was Rs. 3120 crores and profit was Rs. 433 crores. The export turnover was Rs. 103.89 crores resulting in a growth of 55% over the previous year. For the first time exports crossed Rs. 100 crore mark.

**R&D Highlights**

Important achievements as a result of in-house Design & Development efforts are given in the next page:
Pegasus Engine Test Bed designed and developed by Engine & Test Bed Research & Design Center for Indian Navy at Kochi was successfully commissioned, and handed over to Navy.

A highly sophisticated GYRO Sensor required for Missiles Programme, was successfully indenigised by Avionics Division, Korwa.

"Testing Parameters" for Main Gear Box (MGB) OF Sea King Helicopters, which were not made available by OEM (Original Equipment Manufacture) (M/Sgkn west Land Helicopters, UK) due to US sanctions, were successfully developed by Helicopter Division in co-ordination with Indian Navy, RCMA (Regional Center For Military Airworthiness) and DGAQA (Directorate General of Aeronautical Quality Assurance) by extensive strain gauging, instrument and ground and flight testing. The Division has repaired three MGBs and given to Indian Navy to meet their critical requirements.

The overhaul of Laser Head of Laser Ranger and Marked Target Seeker was affected due to US sanctions. Avionics Division, Korwa successfully developed the technology and indenigised the repair of the Laser Roads of this unit.

One aircraft set of Static Inverters for SARAS aircraft was successful developed by Accessories Division, Lucknow, cleared by Directorate General of Civil Aviation and delivered to M/s National Aerospace Laboratories for installation on aircraft.

The power transmission output shaft for ALH affected by US sanctions was successfully developed indigenously including qualification tests by Helicopter Division and it has been cleared for use on production ALH.

The indeginisation of six types of critical Line Replaceable Units (LRUs) of Jaguar aircraft (Phase Sequence Detector, Trainer-side and Pilot-side control Boxes, Accelerometer, Manometric Module and Filter Transformer Unit) was taken up by the Accessories Division, Lucknow due to sudden increase in
price by Foreign Vendors. The division successfully developed, qualification tested and cleared the LRUs for flight trails.

Altimeters imported by the Indian navy for sea harrier aircraft from M/s. Meggiti, USA have become unserviceable and as such, there was an urgent requirement. Aerospace systems and equipment research & design center, Lucknow took up and successfully developed the Altimeters in a record time of six weeks. The Altimeters were successfully tested at INS Hansa and accepted.

Avionics Division, korwa has developed a PC based Bus Analyser for the Jaguar friendly and faster than the existing data bus monitor and control. This equipment can check the message transfer between DARIN LRUS using an interacting menu-driven Software Milgo. It has the self check facility for checking the serviceability of cards of the test unit.

SLRDC, Hyderabad has successfully developed the first flight worthy model (HACK model) of Multi Mode Rader for LCA. The Radar was successfully integrated on systemary, tested for low and medium RPF with detection of flying target. After certification by RCMA and DGAQA the Radar has been positioned at CABs for flight evaluation.

Taking into consideration the prevailing business scenario and with a view to optimize manpower and investments, the company has chalked out the following strategy.

**Outsourcing**

The Company has established outsourcing cells in its various Divisions with a view to progressively achieve 20% to 25% of its turnover through outsourcing after ensuring full utilization of available men and machine. The outsourcing efforts aim to achieve to reduction in cost and rationalize both capital investment and manpower strength. Further, items presently being imported could also be indeginised through Transfer Of Technology (TOT) between Original Equipment Manufactures (OEMs) and the private sector.
The company proposes to offload medium and low-tech jobs to Ancillary and Private Sector Companies having capacity to handle such jobs and would like to concentrate on high-tech areas requiring high investment and core-competence.

A scheme for development of ancillary industry for retired employees of the company was introduced during the year with a view to retain skills in the industry and increase outsourcing levels.

**Exports**

Export of products and services have been identified as the thrust area. As against earnings of Rs.67 crores during the financial year under review, the company has set an ambitious export target of Rs.100 crores for the current year. The company has bagged export orders from Israel Aircraft Industries against international competition for supply of kits for conversion of Boeing 737-300 aircraft to freighter version. The value of the order is about Rs. 18 crores. Another order trail has also been received from SNECMA at France for supply of forgings and castings.

**Information Technology**

The company has formulated an Information Technology (IT) plan during the year under review. Action for establishment of Local Area Network (LAN) at various divisions offices in inter - connect them with Wide Area Network (WAN) has been initiated. The IT plans aims to achieve enterprise - wide integration. Create database and achieve cost - effectiveness in the day-to-day operations.

**Financial Highlights**

During the year 2001-2002, the company has excelled in the financial parameters over the target for 2001-2002 and continued to maintain its success in optimizing the financial resources and reduce the financing costs.
Some of the highlights in financial management are summarized here under:

The company secured highest Credit Rating for an enhanced amount of Rs.600 Crs, (Rs.300 Crs. in the previous year) for long-term debt programme of Rs.300 Crs from ICRA (investment information & Credit Rating Agency) highest Credit Ratings from CRISIL (The Credit Rating Information Service Of India Ltd.) were also obtained for an enhanced amount of Rs.450 Crs. (previous year Rs.150 Crs.) towards long-term and short term debt mobilization;

The company was able to leverage on the dual highest credit ratings and sourced low cost funds from Banks and Financial Institutions, to arbitrage on normal lending rates of Banks and also deployed surplus funds at higher interest rates.

Effective funds management resulted in reduction in interest cost on working capital borrowings through low cost instruments like FRB, Structured Short Term Loans, etc., from Rs.15.20 Crs. In 2000-2001 to Rs.5.8 Crs. In 2001-2002;

Even in the scenario of declining trend of interest rates, the company was able to generate substantial interest income at an average yield of 10.6% which is significantly higher than the prevailing market yield on Govt. securities and other instruments eligible for investment of short term funds as per DPE guidelines;

During the year under review, another benchmark of 9.25% coupon rate was created when the company’s bond issue of Rs.200 Crs. The bond issue was for 7 years with put/call option at the end of fifth year. The company retained Rs. 360Crs. At coupon rate of 9.25%p.a. to refinance the redemption of earlier long term borrowing if Rs. 200 Crs. Mobilized in September 2000 at the then lowest rate of 11.40% and also to finance
capital and R&D expenditure. This has resulted in interest savings of Rs.8.60 Crs. For the residual period of 2 years of earlier issue.

The tax rate was maintained at the MAT rate due to tax planning measures and securing decision in disputed issue in favour of the company from Hon’ble ITAT.

II – Range of Products

The Company has undertaken several new projects. The progress made in respect of important projects as follows.

License Production of SU-30 MKI:
The project for license production of SU-30 MKI aircraft. Engine and associate aggregates has progressed as per schedule. An agreement has also been finalized for setting up of facilities for overhaul. The company plans to produce aircraft in four phases and delivery is planned to commence from the year 2004-2005.

Light Combat Aircraft
The Company has entered into an MOU with Aeronautical Development Agency for setting up of facilities to produce and deliver 8 Light Combat Aircraft (LCA) between 2006-2008 under limited series production. The company would continue to support the flight test programme of LCA. So far, two Technology Demonstrator (TD) Aircraft have been produced. TD-1 has made first block of 12 flights. TD-2 made its maiden flight in June 2002 and so far completed 14 flights.

Intermediate jet trainer
The development programme of intermediate Jet Trainer (H JT-36) as a replacement to KIRAN has progressed satisfactorily. During the year, indigenous development of an intermediate jet trainer, which will be lighter in weight and have better performance and maneuverability with lower operating cost, higher armament carrying capability and modern systems,
progressed satisfactorily and is scheduled to make its maiden flight during the year 2002-2003.

Multirole Transport Aircraft
The programme for the co-design, co-development and co-production of 15-20 tons cargo/100 seater passenger aircraft designated as Multi Role Transport Aircraft (MTA) has been firmed up. A Detailed Project Report (DPR) is being jointly finalized with the Russian partners. The project will be launched after receipt of the approval of the governments of India and Russia. This aircraft will meet the requirement of India and Russia and would also have good potential in foreign civil aviation market.

Jaguar upgrade
The Company has taken up Upgrade of existing Jaguar Aircraft. The upgrade programme envisages fitment of advanced equipment to enhance the navigation and attack capabilities of the aircraft besides pilot comfort.

MIG –27 M Upgrade
MIG 27M upgrade Programme provides for modern navigation attack and electronic self-defense systems for day and night operations. The development is being undertaken indigenously in collaboration with DRDO. The first two prototype aircraft will be upgraded by DRDO with the support of HAL and IAF, while the series upgradation will be done by HAL. The development work has already commenced.

Helicopters
Advanced Light Helicopter (DHRUV) a) Activities for weaponisation of ALH required by Navy, Army have already started. It is expected to complete this task in next 4 years time. b) The prototype for the civil variant of ALH has already been manufactured. It is under Flight evaluation. It is planned to get it certified by DGCA by the end of 2002-2003.
Light Attack Helicopter
The Company has conceptualized and forwarded a technical proposal for development of a 'Light Attack Helicopter' to IAF. Based on the response, development will be taken up through in-house R&D capabilities.

Upgrade of Aircraft
The Company has taken up upgrade of existing jaguars. The programme envisages fitment of advanced equipments to enhance the navigation attack capabilities of the aircraft. The system design work has commenced and the development work is expected to be completed by 2002-2003, followed by flight evaluation and certification by 2003-2004. The new Jaguar Aircraft both trainers and fighters will be produced as per upgraded standard.

The Company has planned to take up gradation of MIG 27M Aircraft to provide modern navigation attack and electronic self-defence systems for day and night operations. The development is being undertaken indigenously in collaboration with DRDO.

Based on the tri-partite agreement arrived at between the company, DRDO and IAF, the first two prototype aircraft will be upgraded by DRDO with support of HAL with the assistance of DRDO. Equipment fit has been finalized and the preliminary development work has already commenced. All the aircraft have been planned to be updated by 2006.

The company is ushering into design, development and production of transport/cargo aircraft in the 14-to 100-seater segments for both Civil and Military application in association with country’s R&D organizations as well as international partners.
The other projects are:
The development of Saras (14 seater) aircraft is being done by Aerospace Laboratories in partnership with the company and other industries and the first flight of the prototype aircraft is planned 2002-2003.

The company had signed a Heads Of Agreement for co-design, co-development and co-production of 15-20 T Cargo/100 seater passenger version state of art Multi Role Transport Aircraft in participation with reputed international partners from Russia viz., Ilyushin Aviation Complex, Irkutsk Aviation Industries association and ROSOBORONEXPORT. Both military and civil versions of the aircraft suitably customized will be produced to suit the needs of Indian and Russian markets. A detailed project report (DPR) is being jointly prepared and both Govt. of India and Govt. of Russia will launch the programme on the approval of DPR.

III – Future Advancements
Several schemes/plans are under active consideration to further boost the performance of the company with special attention to satisfy customer offer world-class products at competitive prices.
These are:
Development Of Core Competence
A scheme for development of core competence of manpower through training is being given final shape. Under the scheme, specialized training courses in various branches of company’s working such as tooling, technology, quality, design and computer application will be imparted to the young Engineers/Officers with a view to keep them abreast with present standards and improve core competence.

Strategic Alliances
In an era of globalization, The company is actively considering several strategic alliances with domestic as well as multinational organizations with a view to diversify and expand in related areas of its operation as well as
acquire latest technology. The strategic alliances aim to optimize optical investments as well as reduce business risks of the company.

The proposals for co-development and co-production of Multirole Transport Aircraft with Russians, and Shakti engine with Turbomeca, France for ALH are under active consideration.

Profit Sharing Scheme
Introduction of a profit sharing scheme for the executives of the company is awaiting the approval of the government. If approved, the company will be the first among the PSUS to implement profit sharing scheme to motivate the officers. The scheme aims to achieve higher productivity and profitability.

Customer service
The company has also chalked out plan to strengthen its customer services network. Service Engineers with adequate infrastructure have been positioned at various customers Operating Bases in order to provide prompt service to the customer and further improve serviceability of aircraft/helicopters.
### TABLE No: III - 1
HAL – Growth Profile For Five Years (Rs.in Crores)

<table>
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<td>Sales</td>
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<td>2400.88</td>
<td>2446.55</td>
<td>2774.81</td>
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<td>2</td>
<td>Value of Production</td>
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<td>2454.43</td>
<td>2603.26</td>
<td>2963.44</td>
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<td>3</td>
<td>Profit Before Tax</td>
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<td>415.26</td>
<td>265.15</td>
<td>373.48</td>
<td>433.37</td>
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<tr>
<td>4</td>
<td>Provision for Tax</td>
<td>20.00</td>
<td>47.00</td>
<td>21.50</td>
<td>28.70</td>
<td>43.41</td>
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<td>5</td>
<td>Reserves &amp; Surplus</td>
<td>867.32</td>
<td>1201.83</td>
<td>1379.11</td>
<td>1640.41</td>
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<td>6</td>
<td>Working Capital</td>
<td>618.82</td>
<td>919.87</td>
<td>603.60</td>
<td>1172.87</td>
<td>714.49</td>
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<tr>
<td>7</td>
<td>Capital Employed</td>
<td>1150.26</td>
<td>1451.11</td>
<td>1177.07</td>
<td>1802.24</td>
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<td>8</td>
<td>Net Worth</td>
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<td>1259.67</td>
<td>1015.20</td>
<td>1229.38</td>
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<tr>
<td>9</td>
<td>No. Of Employees</td>
<td>34828</td>
<td>34448</td>
<td>32642</td>
<td>31652</td>
<td>31138</td>
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</tbody>
</table>

Source: Office records of the study unit

### TABLE No: III - 2
HAL – Manpower Strength For Five Years

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<td>59</td>
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<td>Low</td>
<td>34755</td>
<td>34376</td>
<td>32573</td>
<td>31586</td>
<td>31077</td>
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<tr>
<td>Total</td>
<td>34828</td>
<td>34448</td>
<td>32642</td>
<td>31652</td>
<td>31138</td>
</tr>
</tbody>
</table>

Source: Office records of the study unit
Figure: No-III-1

Source: Office records of the study unit

79
Profile of Indian Telecom Industry

I - Origin and Growth
ITI is India's first PSU set up in 1948. Over the last five decades, it has grown into the country's foremost and largest telecom Company with state-of-the-art manufacturing facilities spread across seven locations, three in-house R & D centers, countrywide marketing and service outlets and skilled manpower of 21,000 employees, with a turnover exceeding Rs.2000 Cr. annually.

ITI has pioneered the development of telecom in India, having contributed to more than 70% of the existing network, which is the world's ninth largest. With its focused technical expertise, targeted reach-out capabilities and networking excellence, ITI has a vertically integrated telecom equipment production set up.

In 1950 the company's status was as a joint stock Company and went for diversification of product orange with the production of Long Distance Equipment. In 1964 it manufactured Crossbar (Electro-mechanical) automatic exchange equipment at Bangalore in collaboration with Bell Telephone Manufacturing Company, Belgium.

In 1971 the company manufactured Multiplex and associated transmission equipment for Trunk Services at Naini and the components were manufactured at Srinagar (J & K). 1983 it manufactured Electronic Exchanges of E-10B type of Mankapur in collaboration with ALCATEL, France, and also manufactured Digital Trunk Automatic Exchange Equipment at Palakad.

In the year 1986 the company established a Network Systems Unit exclusively to take care of installation and maintenance work. It also moved into manufacture of Small and Rural Electronic Exchange of C-DoT
Technology at Electronic City, Bangalore. Later it moved into manufacturing of Digital Coaxial Systems at Bangalore with know-how from AT & T Network Systems, Netherlands, manufacturing of Opto-Electronic Line Equipment at Naini, in collaboration with NKT, Denmark.

The company offers the entire range of telecom equipment covering the whole spectrum of switching (large, medium and small switches, catering to urban and rural needs). Transmission (digital microwave, fiber optic and sitcom products), Access Products and Subscriber Premises equipment. The products and services of ITI have established a track record for dependability in various priority sectors like Telecom, Defense, Railways, Power, Oil etc., and designed specially for the most rugged tropical applications. They have boosted the Indian rural economy and found ready acceptance in many developing countries.

In 1992, it launched the ISO 9000 Accreditation process.

Alive to the technological changes and advancements, ITI offers the latest telecom solutions and customized support to a variety of businesses by virtue of its strong in-house R & D, select collaborations and strategic alliances with global leaders. The Company has a dedicated Network Systems Unit for carrying out installation and commissioning of equipment and for undertaking turnkey jobs and providing value added services. Besides various major projects in India, the Company has successfully executed jobs overseas.

ITI is a self-sufficient Company with adequate resources for conceptualizing, designing, implementing and backing up total telecom solutions and providing Integrated Logistic Support for its clients. The company is consolidating its diversification into IT and IT-enabled services by employing its vast telecom expertise and infrastructure.
As convergence markets open up enormous opportunities in new technology areas, ITI’s potential is reflected in each of its current initiatives. Network Management Systems, Billing and Mediation Software, Encryption and Networking Solutions for Internet Connectivity are some of the major activities of the Company in this direction. The company is providing the Integrated Billing Software and Mediation Systems.

The Company’s foray into IT business has already been rewarded with a share in the Networking segment. ITI is executing the BSNL pilot project for introducing Managed Leased Lines (MLLN) and Voice over Internet Protocol (VoIP) in nine cities. New IT initiatives on in-house development of products include Infokiosks, Computer Telephony Integration (CTI), IP-PABX (Internet Exchange) and e-commerce platform.

The company has taken rapid strides in providing Global System for Mobile Communication GSM (Cellular Mobile Infrastructure) for BSNL and MTNL. The entire West Zone of India (Maharashtra, Gujarat, Madhya Pradesh, Chattisgarh) would be equipped and networked by ITI for Cellular Mobile services to one million new subscribers. This is in addition to Bihar Circle, Jharkhand Circle, Kolkata, Coimbatore, Delhi and Mumbai, where ITI is in advanced stages of building the GSM network. ITI is also focusing on WLL (CDMA) for rural access to meet the VPT programme of the Government as well as for urban. Both these technologies would provide a platform for migration to Internet access and are in line with BSNL’s ambitious expansion programme.

ITI has impeccable credentials to be a global player. With its excellent infrastructure, skilled manpower and efficient customer support, ITI is fully geared to reach out to global markets.
II – Infrastructure & Facilities

Physical Setup
- Inhouse R & D.
- Microelectronics & Computers Division with CAD Centre.
- Network System Unit capable of undertaking turnkey jobs.
- Self contained component evaluation center.
- Fully automated assembly lines.
- In circuit tester (ICT).
- PCB manufacturing facilities.
- Modern Chemical, Metallurgical Labs.
- Mechanical fabrication/Machine shops with modern CNC machines.
- Moulding & Die casting.
- Full fledged state of the art tool rooms.
- SMT (Surface mount technology).
- Thick film hybrid fabrication.
- Environmental testing.
- Component approval center approved by Department of Telecommunications.
- 1 Micron - VLSI/ASICs Lab facility.

Typical Volumes Of Production

Switching
- Large Digital Switches -2.5 Mn Lines.
- Small and Medium Switches -1.2 Mn Lines

Transmission
- Digital Microwave Systems -2500 TRS
- Optical Fibre Systems -2200 NOS
**Telephones**
- 1.2 Mn

**Network Management System**
Online Hierarchical Network management System provides a centralised monitoring and control function for diverse Telecom Network.

The Network management System ensures high quality of uninterrupted service with optimum utilisation of network resources resulting in the improvement of over all Network performance and productivity. The System is highly flexible and can be tailored to the specific requirements of any Telecom Network.

**Research And Development**
ITI's technological strength lies in its vibrant R&D and Micro- electronics division. Products developed by R&D forms a major portion of the company's turnover. The resources include:

**An exclusive core R&D** manned by highly qualified and talented engineers with ISO 9001 certification and representation in national and international level quality standard panels.

**State- of -the- art design aids**
- Modern facilities for complete equipment and system evaluation
- Comprehensive vendor evaluation facilities
- Approval and qualification facilities to match international standards.
- Customised Telecom and IT solution expertise.
- Expertise in adapting imported technology/products to the country's requirement.
Micro Electronics Division

Microelectronics had its origin in the company with the need for increased integration of components and achieving miniaturisation with improved reliability performance and low cost. The resources include:

Hybrid microcircuits facility using thin film / thick film technology has been providing modules for high frequency / low frequency communication equipment. Large volume production facility exists at Mankapur plant to cater to large Digital exchanges.

Upgraded VLSI (Very Large Scale Integrated circuits) based on 5 -micron and 3 -micron CMOS digital single level metal gate array technology. ITI has been providing prototyping and pilot production services for ASICs (Application Specific Integrated Circuits) through this facility.

Recently ITI has established a 6 inch pilot line wafer fabrication facility for 1 -micron digital ASICs. The cell based technology can cater to upto 50 MHz requirements and support complexity of upto 120000 devices per chip. The facility is designed to achieve 0.8 - micron level through indigenous efforts. With the establishment of this wafer fabrication facility ITI has integrated ASIC facility including design, wafer fab., assembly & packaging and testing and is in a position to offer turnkey ASIC solutions to customers.

Bangalore Plant

This is the first Plant of ITI set up in 1948. With its, vertically integrated, state-of-the-art infrastructure a vast range of telecom products are manufactured. They include digital switches (large, medium, small), Digital Microwave equipment, optic fibre equipments, satellite communication equipment, access products, terminal equipments.
Electronic City Plant
Established in 1980s, this plant commenced manufacture of CDOT switches in 1987. This plant is a lead manufacturer of products developed by the Centre for Development of Telematics (CDOT). It has modern facilities for assembly, system integration and testing.

Mankapur Plant
Established in 1983 for the manufacture of large digital switches (E10B). This Plant has modern vertically integrated infrastructure for manufacturing. The OCB 283 / CSN exchange in technical collaboration with Alcatel is manufactured in this Plant.

Rae Bareli Plant
Set up in 1973 in the State of Uttar Pradesh for manufacturing electro-mechanical switches, this plant has been continuously upgraded to changing technologies. The Plant manufactures digital switches, (large, medium, small).

By virtue of its original facilities it is also suited to take up high precision component manufacture. The modern infrastructure include metal parts manufacturing, finishing shops, moulding and die casting, modern assembly and testing with Surface Mount Technology and full fledged tool room.

Palakkad Plant
Established in 1976, the plant manufactures large digital switches and digital trunk exchanges in collaboration with M/s Alcatel. A lean and highly productive plant by virtue of its structure it has modern facility for PCB manufacture (including multi-layer boards) assembly and automated testing facilities with SMT line and environmental test lab.
Its Joint Venture Company, ITI COMMUNICATIONS PTE LTD., represents ITI in Singapore and Nairobi for addressing the South-East Asian and African markets. Besides various projects in India, ITI has successfully executed turnkey projects overseas, in countries like Nepal and Uganda. ITI has exported ADPCM, Rural Exchanges, Telephones, spares for E-10 B exchanges, Single Channel VHF Radio, Multi Access Rural Radio (Analog and Digital both) and ASICs to countries in Asia, Africa and Europe.

Having acquired knowledge and experiences similar to those prevailing in SAARC and African countries, ITI offers consultancy for setting up of turnkey projects in developing countries. ITI believes in maximum exploitation of existing networks by the enhancement of their useful life.

Exports
ITI has exported products such as ADPCM, Rural Exchanges, Telephones of different types, spare cards for E-10B exchanges Single Channel VHF Radio, Multi Access Rural Radio (Analog and Digital both) and ASICs to countries in Asia, Africa and Europe. Besides various projects in India, ITI has successfully executed turnkey projects overseas.

III – Major Customers

Global customer profile include the following countries
Botswana  Sri Lanka
Comoros  Sudan
Gambia  Switzerland
Ireland  Uganda
Madagascar  Vietnam
Malaysia  Yemen
Nepal  Zimbabwe
Rwanda
Its Joint Venture Company, ITI Communications Pte, represents ITI in Singapore and Nairobi. Ltd. for addressing the Southeast Asian and African markets.

ITI has the expertise and resources in the areas of Telecom products and services, Joint development, Setting up of manufacturing and customer care facilities, Contract manufacturing, Installation and commissioning and Market support in India.

Having acquired knowledge and experiences similar to those prevailing in SAARC and African countries, ITI offers consultancy for setting up of turnkey projects in developing Countries. ITI's focus is on providing affordable total telecom and IT solutions, based on state-of-the-art technologies, while ensuring lifetime maintenance support.

Having gained enormous experience in contributing to more than 70% infrastructure of the vast Indian Telecom network; which is the 9th largest network in the world; ITI specialises in supporting and integrating complex network solutions. ITI also has a proven track record of providing ruggedised rural communications systems, which has found wide acceptance in India and several other countries. ITI's focus is on providing total Telecom and IT solutions backed by complete lifetime maintenance support.

**IV - Future Advancements**

Turnkey Project Management and Total Telecom/IT solutions have enriched the Company's portfolio. The most significant of them are the state-of-the-art secure Communication Network for Defense and the CIVICON Project based on secure Satellite Communication Network for the Ministry of Home Affairs. They have been won against stiff competition and their implementation is in progress.
The Company has been short-listed for execution of other major contracts for State Government Networks and corporate clients. The company is building up fully secure ATM-based Networks, which demonstrates ITI's strength in Encryption and Total Solutions. ITI's focus is on providing total Telecom and IT solutions based on complete Lifetime Maintenance Support technology.

ITI works on leading edge technologies, at the same time helping in maximum exploitation of existing networks for their economical lifetime usage, eg., it is in a position to offer extremely cost effective alternatives for network expansion and upgradation in those countries where E10B (OCB 181) is in operation.

This equipment has been upgraded by ITI in some plants already, resulting in the reduction of hardware by more than 30%, correspondingly increasing reliability. For countries still using open wire, ITI can also offer cost effective solutions to enhance utilization of systems with 3 Channel and 8 Channel equipment. The Company's role as a significant resource provider for building vital infrastructure is underscored by the fact that ITI continues to maintain its leadership by being the largest supplier of switching equipment as well as the SDH Fiber Optic Terminals enhanced by supply of DWDM equipment to the country's telecom network.

The major thrust being placed on speedier implementation of new technologies and faster skill formation in new areas, as part of the total restructuring exercise, would lend ITI a keen competitive edge in the convergence market. Having repositioned itself as a Total Solutions provider in the emerging environment, the company is poised to play a major role in the telecom and IT scenario—Anytime, anywhere.
### ITI – Growth Profile For Five Years (Rs. in Crores)

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<td>(2)</td>
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Source: Office records of the study unit

### ITI- MANPOWER STRENGTH FOR FIVE YEARS

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<tr>
<td>Total</td>
<td>23945</td>
<td>23567</td>
<td>22914</td>
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<td>19692</td>
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Source: Office records of the study unit
Organization Structure of ITI

Fig: No-III-2

Source: Office records of the study unit
Profile of Bharat Earth Movers Limited

I – Origin and Growth of BEML

India’s introduction to the earth moving sector was through BEML which was incorporated in 1964, under the ministry of Defense, Government of India, started operation on 1965. It is involved in the manufacture and marketing of heavy earth moving machinery. The company has been shifting focus to newer areas due to dwindling orders from these clients and to remain competitive. The company is facing severe competition from multinationals. It exports its products to Syria, the UAE and Tunisia.

Bharat Earth Movers Limited is a premier ISO 9000 Company in India and the second largest manufacturer of earthmoving equipment in Asia. A three-decade-old multi-locational and multi-product company, BEML has vital applications in diverse sectors of economy such as coal, mining, steel, cement, power, irrigation, construction, road building and railway. It has expanded its product range to cover high-quality hydraulics, heavy-duty diesel engines, Welding robots and undertaking of heavy fabrication and machining jobs.

BEML is the pioneer and market leader in earth moving equipment with a 55 per cent market share. The company’s main products are bulldozers, shovels, excavators, dumpers, and railway and transway passenger coaches. Due to its huge market share, the company derives substantial revenue from servicing existing machines with its clients. In a strategic move, the company has decided to diversify into the road construction equipment segment which has good potential considering the volume of activities taking place in road construction.

It is contemplating becoming a one-stop shop for all earth moving equipment required for mega road projects. It will achieve this goal by adding new products to its portfolio through tie-ups with multinationals. The new product
portfolio would include vibratory compactors, crushing equipment, batching plants and asphalt pavers. BEML has already initiated talks with Steelfields, UK, for supply of batch-mixing plants; with Kawasaki, Japan, for pavers; and, Europactor, Spain, for vibrator compactors, commonly known as road rollers. The company, which clocked a turnover exceeding Rs 1,300 crore, has three segments in its product range.

A public sector undertaking, BEML commands 70% market share in domestic earthmover industry. Nearly 40% of its equity has been divested to financial institutions and public. The bureaucratic regulations, which controlled all economic activities in the past over decades, are now subjected to amendments. Certain amendments were introduced and the Government called it Liberalization.

BEML has its corporate headquarters and central marketing division in Bangalore with 11 regional offices, large number of district offices, spare parts depots, service centers located in different parts of the country. BEML’s application engineering group offers consultancy services for optimum fleet planning, equipments selection and effective utilization of fleet.

**Marketing**

A nationwide network of 33 marketing offices provides customers with immediate access to BEML’s range of products and services. Marketing activities include field operations and intensive training of customer personnel in operation and maintenance of equipment. BEML offers application services encompassing pre and post sales. Preparation of pre-feasibility reports, equipment selection studios, total fleet optimisation solutions and customisation of equipment form part of the application engineering activities. Recommendation-for-User-Profit (RUP) studies enable customers to improve machine productivity and reduce operating costs. BEML’s marketing strength and reach has enabled it to achieve a share of over 70%.
Research and Development

BEML R&D achieved a record 85% average indigenisation in the collaborated products. As many as 30 value added products have been developed in-house. Rs. 300 million R&D centre with sophisticated laboratories in fluid power, material science, power line testing, structural engineering and CAD facilities forms the nerve centre of BEML. The centre is partly funded under United Nations Development Program and has joined hands with several user organizations like BRDB, DRDO, DST and Railway board for development of new products.

One of the most notable achievements to R&D's credit has been undoubtedly the highly sophisticated R&D centre established at KGF in 1984. This centre is indeed a vital contribution towards strengthening the earthmover and related industries in the country. Comprehensive facilities in highly specialized areas are available at the centre. Extensive computerization has led to highly advanced technology development in various areas of activities in BEML R&D division like CAD, fluid power, power line testing and structural engineering.

Fluid power laboratory

Fluid power plays an important role in the functioning of all earthmoving equipment. About 25% of the components that go into the assembly of earthmoving equipment comprise hydraulic systems.

The fluid power laboratory was totally planned and executed through in-house expertise with indigenous resources available in the country. Established in 1985, this laboratory has been provide with sophisticated electronic controls and networking with CAD centre. Computer aided testing is now being incorporated, paving the way for total automation and a filter testing facility will be added to augment the existing facilities.
**Development activities**

Exploiting the existing ring topology for a design database management system environment where the PC ATs would serve as data entry terminals and the CAD workstations as data querying station at the design stage.

Simulation of systems and sub-systems of the earthmoving equipment Computerising various test laboratories in R&D centre so as to establish computer aided testing and integration of the same with the CAD centre for centralised information gathering.

**Technical information centre**

The highly advanced technical information centre (TIC) with its computerised storage, translation and retrieval facilities is a rich source of technical information for carrying out R&D activities.

Apart from an impressive collection of publications, the TIC has well-established documentation wing with micro-filming, blue printing, binding and fire proof storage systems. TIC aids R&D engineers in conducting on-line search with international data base network lines like DIALOG and ESA.

**Quality in R&D division**

At BEML, modern methods of company-wide quality programmes are adopted to ensure the highest quality standards at all stages of production.

The facilities established at the R&D centre have a significant role to play in this direction. It is here that type approvals of the products are established and validation and type approval of the modifications of the products and attachments are confirmed. The quality of materials used are checked for specification standards. In addition, R&D division plans to introduce laser technology in the manufacturing process for close tolerance achievement and
advanced heat treatment procedures for improved performance with respect to strength, wear and creep resistance.

**Standardisation cell**
The standardization cell, set up at the R&D centre in 1986, is an agency for establishing a company wide codification system, effecting variety reduction through standardisation of raw materials, rationalisation of raw material sizes and standard components. The cell formulates standardised practices for design and drafting based on BIS/ISO recommendations and lays down stipulations for inspection, workmanship, processes, procedure and safety requirement standards.

**R&D manpower**
Behind the success of R&D division is undoubtedly the brain power of its highly competent engineers. 200 highly qualified professionals of R&D division have specialised in advanced fields of mechanical design, engine technology, structural engineering, material science, fluid power and electronics.

Inducting trained personnel and exposing the existing R&D manpower, to continuing education in India and abroad to imbibe latest technology, is an ongoing process at BEML.

**R&D perspectives**
R&D division is gearing up to meet the challenges of future technology which is becoming more and more interdisciplinary in nature. Electronics has prevailed almost all areas of operations and R&D division is increasingly orienting its studies towards mechatronics, robotics and industrial automation.

BEML aims to provide its customers in core sectors with state-of-the-art equipment of the highest quality, reliability and performance standards.
Towards this end BEML R&D division is further strengthening itself as an indigenous and innovative base for mining and construction systems, railway and transportation systems, energy systems, robotics and automation systems on par with the best in the world.

Manufacturing
Bangalore-BEML started in 1964 with the railway equipment division at Bangalore. The first rail coach factory in the Indian subcontinent. This unit has consolidated its status as a major supplier of integral rail coaches, meeting about 25% of the country's demand. It has a production capacity of over 800 coaches per annum. To meet the growing requirements of rail sector, BEML has diversified in manufacture of Overhead Equipment Inspection Cars and Track Laying Equipment. These have been developed in-house and supplied to Indian Railways. Recently this unit has taken up production of Electric Multiple Units and Rail Bus. Development of specialised equipment like Treasury Vans and Spoil Disposal wagons has been successfully completed.

Mysore-The biggest dump truck factory in India is located here. Apart from the popular 35 ton and 50 ton rear Dumpers, BEML also manufactures 85 ton and 120 ton dumpers here. Plans are afoot to take up manufacture of giant 170 ton dumpers on the production line. BEML has installed an arc welding robotic system for fabrication of giant structures with consistent quality. The integration of robotised manufacture on the shop floor has accelerated the pace of activity and provided a flexible and powerful facility.

Engine division has been established to manufacture diesel engines of 100-1000 hp rating at Mysore. These are used not only for captive consumption but also for applications like diesel generators and compressors. The company has installed flexible manufacturing systems for component manufacturing.
The flow of state-of-the-art technologies from global partners like Bucyrus, Komatsu, Omnipol, Voest Alpine, IGM and Bumar labeedy has enabled BEML to achieve high standards in product engineering and gain international competence.

KGF-At Kolar Gold Fields, located about 100 kms from Bangalore, BEML has established an extensive manufacturing base. Skilled workforce of over 6000 turns out state-of-the-art bulldozers, Hydraulic Excavators, Wheel Loaders, Rope Shovels and Walking Draglines for the mining and construction industry. Sophisticated CNC machines and latest technology welding equipment are installed.

Multi-million rupee heavy equipment shop has been set up for major fabrication with a capacity of 5000 MT. This shop turns out heavy structures. The exclusive hydraulics and powerline division, manufactures precision assemblies and aggregates, not only for captive consumption but also for meeting customer requirements. State-of-the-art gear pumps, control valves, suspension cylinders, heavy duty planetary axels and automatic transmissions are productionised here.

**Customer Services**

Maximizing customer satisfaction is the key objective guiding BEML's customer service activities. Apart from timely supply of spare parts, training, rehabilitation of equipment, maintenance assistance and servicing of equipment are also provided. Spare parts depots have been set up at marketing offices and at major project sites to provide spare parts at short notice to customer. A satellite-based communications network called BEMLNET has been installed connecting all computers at depots to the central spare parts operations, enabling faster response to customer needs. BEML site engineers take services to the doorsteps of customers. Service centres have been set up at various parts of the country to take up large
repair and rehabilitation tasks that cannot be performed in the field. Periodic monitoring of equipment performance is carried out to detect trouble spots and take preventive action, thereby ensuring higher availability of the equipment.

**Earthmoving equipment**
This division, through its three manufacturing units in Bangalore, Mysore and Kolar Gold Fields, produces state-of-the-art earthmoving equipment bulldozers, dump trucks, hydraulic excavators, wheel loaders, rope shovels, walking draglines, motor graders and scrapers -- that caters to the core sector. It has also introduced road headers and slide discharge loaders for underground mining applications.

**Railway rolling stock**
Under the railway division, products include rail buses, track laying equipment, heavy-duty trucks and trailers and overhead equipment inspection cars.

**Defence equipment**
This division, which accounts for a third of the company’s turnover, supplies military equipment, including trucks, engineering mine ploughs, armored recovery vehicles and transportation trailers. These products are supplied exclusively to the defence department in India.

**Quality**
Quality is the hallmark of excellence. At BEML, a Corporate Quality policy emphasising total quality management ensures that quality system adopted company wide to meet stringent standards and requisite performance criteria. A separate Quality Division spearheads the thrust towards total quality. All the manufacturing facilities in the company under ISO 9000 certification. BEML equipment work in inhospitable terrain under gruelling operating conditions.
People
At BEML, people are the prime movers. Concern for human values finds expression in the work environment that fosters team spirit and rewards achievement. Motivation, training and welfare are accorded top priority in developing human resources.

Employees are trained in multi-skills to upgrade their potential, to achieve targets. Investment in manufacturing facilities has been accompanied by development of safe work practices. Facilities for housing, healthcare, canteen, education and sports have been provided to increase motivation and performance. As a corporate citizen, BEML is conscious of its responsibilities to society and environment. The Company extends a helping hand to community development, environment preservation, social forestry, education and medical extension programmes for backward villages around its divisions.

Exports
Over the years, BEML has built up a reputation as a top quality supplier of surface mining equipment. BEML exports machines to over 25 countries in Europe, Africa and the Middle East. BEML is a recognised export house.

BEML's strength in handling large scale trading and counter-trade have yielded results in enhancing export activities. In addition to export of equipment, BEML's International Division exports engineering goods, commodities and services. During the year 96-97 Beml exported goods worth Rs 622 million.

BEML plans to further strengthen its global presence by setting up overseas offices and joint ventures in diverse areas, and by executing turnkey projects in mining and allied fields.
II - Range of Products
BEML manufactures a wide range of products to meet the needs of Mining, Construction, Power, Irrigation, Fertilizer, Cement, Steel and Rail Sectors. The earthmoving equipment includes Bulldozers, Dump Trucks, Hydraulic Excavators, Wheel Loaders, Rope Shovels, Walking Draglines, Motor Graders and Scrapers. BEML has recently introduced Road Headers and Slide Discharge Loaders for underground mining applications.

Railway products include Integral Rail coaches, Electric Multiple Units, Rail Buses, Track Laying Equipment and Overhead Equipment Inspection Cars. BEML manufactures Heavy Duty Trucks and Trailers and hydraulic aggregates for transportation sector.

The company also manufactures high power diesel engines and heavy-duty hydraulic aggregates to meet specific customer requirements. The company plans to diversify into varied activities including underground mining equipment, underground storage for petro-products, leasing and financial services and joint ventures abroad.

III - Future Advancements
BEML not only maintains its leadership in earth moving industry within India but constantly breaking into new ground overseas, vendor assessment and development is a key component of the company’s strategy. Company has established “BEML NET” a satcom network to streamline spare parts supplies for maximum customer satisfaction. BEML site engineers ensure taking service to the doorsteps of customers. Company guarantees service to machines throughout its lifetime.
BEML exports to over 30 countries across Europe, Africa and Asia and America. As an export house, BEML have expended operation to include exports of engineering goods, defense items, commodities and undertaking of project management and turnkey contacts.

**Indigenisation**

R&D, by indigenisation of BEML products, components and attachments has enabled the company to save precious foreign exchange. All this has been achieved without compromising the quality of products which match up to international standards.

BEML has recently diversified its product range with the introduction of high capacity, high value products involving sophisticated technology like 120, 170T dump trucks and 10Cu.m rope shovels. 24Cu.m Walking Draglines, 740HP dozer. BEML R&D is fully geared up to indigenise all these equipment on a time bound schedule and to reduce the outgo of foreign exchange.

Mr. V.R.S. Natarajan, Director (Personnel), at the public sector Electronics Corporation of India Ltd (ECIL) is Chairman and Managing Director (CMD) of the Bharat Earth Movers Ltd (BEML), Bangalore. Having joined ECIL at a crucial juncture in 1997, Mr. Natarajan is one of the key top management executives, who play an important role in the turnaround course of the PSU, under the Department of Atomic Energy (DAE) in subsequent years.
### TABLE No: III - 5

**BEML – Growth Profile For Five Years**
(Rs. in lakhs)

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<td>Sales</td>
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<td>Reserves &amp; Surplus</td>
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Source: Office records of the study unit

### TABLE No: III - 6

**Manpower Strength For Five Years**

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Source: Office records of the study unit
Profile of Bharat Electronics Limited

I – Origin and Growth of BEL

Bharat Electronics Limited (BEL), the premier Professional Electronics Company in India which has the distinction of being the first public sector enterprise under the ministry of Defense, to acquire operational "Mini Ratna" status, declared an all-time high dividend of 50 percent for the fiscal 2001-02. In a year when the general economy was down, BEL reached its highest ever turnover of Rs. 1,942 crores during 2001-2001 with Profit After Tax of Rs. 200 Crores. With a healthy order book position of over Rs.4000 crores, BEL is poised for sustained profitable growth. In 2002-03 BEL is all set to cross the Rs..2,000 crore mark, which will be a significant milestone.

BEL was established in 1954 to meet the defense electronic equipment requirements of Indian Defence Services. Over the years, it has grown into a multiunit, multi-product, multi-technology company with nine manufacturing units in the country serving the needs of customers in diverse fields. Its corporate office is at Bangalore.

BEL started its activities by manufacturing basic communication equipment for the defense. At this stage, BEL depended on overseas technologies for its operations. BEL gradually consolidated its technology base and graduated into the design and development of its own equipment. Ties with Defense Research and Development Laboratories were forged and strengthened.

It is engaged in the design development and manufacture of sophisticated state-of-the-art electronics equipments/components for the use of defense services, Para military organizations and other governmental users like All India Radio, Doordarshan, Department of Telecommunications, Police Wireless, Meteorological Department, etc. The BEL is also the premier indigenous source for professional electronic equipment.
State-of-the-art manufacturing testing and quality assurance facility has been set up in all units of BEL. On line computerization for materials management state-of-the-art test facilities, facilities for carrying out environment and reliability checks electro-magnetic interference/Electro Magnetic Compatibility Testing facility, Antenna Testing facility, back-up support from Standardization Technical information and Documentation, Computer Aided Design and Manufacture have made BEL a modern professional Electronic Company.

BEL has adopted the Total Quality Management (TQM) approach. All manufacturing divisions/units of BEL have been accredited with ISO 9002/ISO 9001. ISO 14001 accreditation has been attained by the Ghaziabad Unit and the Engineering Services Division of Bangalore Unit. Bharat Electronics Limited (BEL) designs, develops and manufactures state-of-the-art products in the field of Radars, Defense Communications, Telecommunications, Sound and Vision Broadcasting, Opto-electronics, Solar systems, IT products and Electronic components. BEL has the expertise in engineering Radar, Telecom and Satcom networks, providing network solutions to meet customer needs. These systems are supplied and commissioned on turnkey basis.

A continuous effort by BEL to improve its technology base has resulted in a wide range of more than 350 products. Releasing the need for an indigenous base for strategies components, BEL has set up infrastructure for the manufacture of components. BEL has set up central Research Laboratories at Bangalore and Ghaziabad for undertaking blue sky rise-arch km futuristic technologies. These labs help BEL to identify and realize cutting edge technologies relevant to the company’s needs.

With over four decades of manufacturing experience Bharat Electronics Limited has pioneered the professional electronics movement in India. With continuous up gradation of technology, commitment to quality and constant
innovation, BEL has grown into a multi product, multi unit, and multi
technology company. In its quest for technical excellence, BEL has set up
independent R & D division in each of its nine units and strengthened them
over time.

The annual expenditure on R & D activities is about Rs.90 crores,
representing over 5 percent of the annual turnover. Consequently, 66
percent of BEL's turnover today accrues from products developed either in-
house or in association with DRDO labs. The strengthening of its R & D base
has enabled BEL not only to support all the equipment and products in the
field for periods ranging from 10 to 25 years but also to upgrade and
redesign the products on a continuous basis.

II – Range of Products
BEL in association with DRDO labs, has broken new ground in the Radar
Field. New Radar is being equipped with an antenna, which employs the
Array-technology. BEL manufactures a comprehensive range of Radars for
defense as well as civilian applications.

Radar systems offered from BEL are for applications like Surveillance, Fire
Control, Tracking and Navigation. In the category of Land based Radars, BEL
manufactures systems for 3D Surveillance, Secondary surveillance, fire
control and battle field surveillance.

Bharat Electronics manufactures and supplies Communication equipments for
the Defense forces - covering ground, air and ship borne equipments and
systems. BEL is in the final stages of introducing Radio Communication
equipment with Frequency Hopping for the services, which would make the
communication equipment being developed by BEL have high speed data
transfer capability in addition to voice communication.

Expertise gained by BEL in the defense sector has reputed in the emergence
of spin-off technologies, which are beneficial to society. Products covering
fields such as energy conservation, fleet management, information
technology and telemedicine have evolved over the years. The ability to
manufacture command and control equipment led to the manufacture of
coastal surveillance and Telemedicine systems, development of embedded
software laid the foundation for the development and manufacture of the
electronic voting machine; ability to manufacture high quality surface
mounted Device boards reputed in the manufacture of motherboards for
PCS; ability to supply High power Transmitters for its Radar's enabled
development and supply of HPTs to AIR and Doordarshan.

For Naval applications Radars offered are in the Navigational, Fire control and
Surveillance categories. In Civilian category BEL offers radars for Air Traffic
Control. The frequency bands covered extend from C band up to Ka band. BEL
also offers Networking of Radars.

SONAR products from BEL cover the range of under water applications for
surface ships, submarines and Naval aviation. BEL also offers Naval systems
in user defined configurations for different types and classes of ships,
submarines and other platforms and applications.

Tank Fire Control System MK 1B AL 4421 is designed to reduce the
engagement time leading to an increase in kill rate and to improve the first
round hit probability. The system is capable of engaging static or moving
targets with own tank stationary or static targets with own tank moving.

During the year 2001-02, BEL earned the distinction of becoming the first
Defence PSU to acquire operational MINIRATNA CATEGORY-I status. This
enhanced status will provide BEL certain operational autonomy in the areas
of capital investment, establishment of Joint Ventures etc.

A number of initiatives were taken to diversify the business of BEL and
secure orders. In September 2001, BEL won a tender of Rs 18 crore from
Andhra Pradesh Government towards establishing a network (APNET) for
state-wide broadcast and communication upto district/block level. The hub has been commissioned and the terminals are in various stages of completion. The Andhra Pradesh Government has now invited BEL to give a proposal for Phase II of the project to cover the whole State. The value of Phase II will be around Rs.40 crore.

BEL secured a large number of orders for the LED based Solar Traffic Signals in Bangalore, Hyderabad and New Delhi etc.

BEL and Indian Space Research Organization have entered into an understanding for cooperative efforts to meet the growing demands of satellite manufacture in India. Satellite Electronics Payload (Transponders)- a major part of any satellite will be manufactured by BEL for integration with the satellites to be launched by ISRO.

BEL has also commenced manufacture and supply of solar-based mini power plants, the first of which has been installed in a technology foundation in New Delhi.

**Manufacturing and Support**

Bharat Electronics has a sound-manufacturing base that caters to an unusually wide spectrum of technologies. In the early years, its 39 know-how/license agreements with internationally reputed companies helped the company to absorb and assimilate production technologies within a short span of time. It also ensured organized production of electronic equipment and components of international quality standards and established a viable manufacturing base capable of handling a variety of products.

**Design and Manufacturing Services**

Bharat Electronics Limited today has an integrated approach and systems capability, which is a direct result of its commitment to providing tailor-made solutions to the customers through its philosophy of quality management.
The company has set up impressive infrastructure and manufacturing facilities spread over nine ISO 9001 / 9002 certified modern production units around the country. The infrastructure is regularly upgraded with the latest and state-of-the-art facilities. Manufacturing infrastructure is amply supported by the applicable Quality Assurance infrastructure and skilled technicians. Standards Division of BEL optimises the processes on a continues basis. Process and QA standards generated by BEL are used as reference by a number of companies in India. With the strengths in infrastructure and skilled/experienced manpower, BEL offers Contract Manufacturing Services for both domestic and international customers in the following areas:

PCB Assembly (SMT, Through Hole, BGA) And Testing- BEL has set up an exclusive Mass Manufacturing Facility and achieved proficiency in assembly of a wide variety of circuit board designs including Surface Mount Technology (SMT), Mixed Technology and Plated / Pin Through Hole Technology (PTH). BEL also offers most modern facilities for testing of the products manufactured.

**Niche products**

Alarm System for unmanned level crossing-Automatic Alarm System for Unmanned Level Crossing is an Audio Visual alarm system designed to sense the arrival of the train from a distance of 2 Kms. It helps take steps necessary to avoid accidents at places where there is no person manning the railway crossing gates.

Bharat Electronics Limited is a Pioneer in the field of Professional Electronics in India and has been manufacturing a wide range of Defence and Civil communication products since 1954. Multiple years of operations covering design, development, engineering and manufacturing professional electronics equipment in diverse fields based on various technologies has enabled BEL to offer end-to-end system solutions on turnkey basis.
BEL today offers solutions from concept to commissioning covering a variety of fields like:

- Terrestrial, SATCOM and hybrid communication networks for voice, video and data applications
- Radar networks for defence applications
- C3I systems which operate in real time integrating a variety of sensors for data acquisition and processing, display and weapon designation in a multi-threat environment
- Coastal Surveillance System consisting of a network of surveillance radars, centrally located control and communication centre and Vessel Identification system
- Composite communication systems for ships
- Telemedicine system solution for major hospitals
- Integrated Distance Learning solution

Today Bharat electronics’ capabilities in mass manufacture are enhanced by the high-technology, fully automated surface mount Technology (SMT) assembly line, commissioned at the mass manufacturing facility at Bangalore complex. This is the first of its kind in the country. In keeping with the standards of the electronics industry world wide, Bharat electronics constantly updates its manufacturing infrastructure. Further, an exclusive department ensures that the company lives up its ‘state-of-the-art’ standard in all its manufacturing operations.

Over the years, BEL has grown from strength to strength, surmounting obstacles and challenges that lay in its path with resilience and determination, backed by a professional management and dedicated workforce.

**Quality Assurance Facilities**

BEL has set-up a separate Quality Assurance division with an investment of around USD 4mn for the implementation of quality assurance system
throughout BEL. This division is engaged in a variety of quality assurance tasks like:

- Component Testing
- Material Testing
- Material Inspection
- Electronic Measuring Instruments Calibration
- Quality management services
- Electromagnetic compatibility testing
- Environmental Testing
- Reliability analysis
- TORQUE services

The Environmental Test Department conducts tests as per relevant JSS, BIS, MIL, DEF, IEC and IES specifications. To meet the ESS requirements, the department has environmental chambers with heating and cooling rate of 5-degree centigrade/minute. Thermal Cycling, Altitude, Salt Corrosion, Dust, Vibration, Shock, Bump and Drop tests are also conducted on various products for Prototype Evaluation, Qualification and Acceptance Testing, Process qualification, Batch acceptance and Analysis of Field failures. All the facilities are periodically calibrated with calibration traceability to national and international standards.

Electromagnetic Compatibility Test facilities have been established at BEL for quantifying the spectral pollution caused by equipment and the vulnerability of equipment to such pollution. The facilities setup as per the requirements of Defence Standards MIL-STD-461 and 462, include RF Shield Anechoic chamber with >100 db shielding effectiveness (measuring 8m X 7m X 3.5m) and the necessary test instruments to conduct automated emission and susceptibility tests from 20 Hz to 18 GHz.

Calibration laboratory for Test and Measuring Instruments has been set up and is in operation in accordance with standards like MIL-STD-45612A and ISO 9000. The lab is traceable to national standards, which in turn has
International traceability. BEL calibration lab is equipped with facilities to calibrate a wide variety of instruments like Digital Multimeters, Oscilloscopes, Power Meters, Frequency Counters, RF signal generators, AC-DC calibrators and Microwave test instruments such as Spectrum Analysis and Vector network analysers covering a frequency spectrum of DC to 40 GHz. BEL also offers all the above facilities for use by designers and manufacturers of electronic equipment and other customers in India as well as abroad at very competitive rates.

**Software Development**

The Software group in BEL is powered by over 100 software systems professionals whose experience covers application areas of Defence, Space, Communication and Commercial segments. Their familiarity with hardware environment extends across VAX 11/780, Micro VAX, Sunsparc and PC-Pentium Systems, and familiarity in software system covers UNIX, VMS, iRMX, QNX, pSOS+, operating systems using Watcom C, Borland / Visual C++, iC386 / iC86.

The Software Development group works on various areas like embedded processor applications, real time applications, graphics, CAD, CAE, automatic testing and simulation. The Core expertise of the group lies in mission critical applications in areas such as Radar Systems, Military Switching Systems, Command and Control Systems, Process Automation and Network Monitoring Systems.

**Joint Ventures**

**BEL and GE Medical Systems**

GEBEL is a joint venture between Bharat Electronics and General Electric Medical Systems. The facility based at Whitefield, Bangalore, India, manufactures X-ray tubes, for RAD & F and CT systems, as well as components such as High Voltage Tanks and Detector modules for CT system. The products are exported worldwide and meet the safety and regulatory standards specified by FDA, CE, MHW, AERB and the facility have
been accredited with ISO 9001 certification. GEBEL also markets the conventional X-ray tubes made at Pune Unit of BEL.

The turnover of GEBEL during 2002-2003 was over Rs. 350 Crores including an export of over Rs. 310 Crores.

The company was recognized for its outstanding export performance during 2000-01; 2001-02 by the Export Council. Besides, the facility has been recognized by GE as a Global Star site meeting the Environment, Health & Safety standards.

Apart from manufacturing, a dedicated engineering team is working on the development of new tube technologies to meet global needs.

**BEL and Multitone**

BEL and Multitone, UK, offers state-of-the-art Mobile Communication Products for the workplace. Multitone invented paging in 1956 when it developed the world's first system to serve the "life or death" environment of St.Thomas Hospital, London. With the strength of Bharat Electronics in the Radio Communications field and the technology of Multitone in the field of Radio Paging, the joint venture company is in a position to offer tailor made solutions to the Mobile Communication needs at workplaces in various market segments.

**III – Major Customers**

1. Defence
2. Army
3. Navy
4. Air Force
5. Non-Defence
6. Para military
7. Space department
8. All India Radio
9. Doordarshan (TV network)
10. Ministry of education (NCERT)
11. Department of Communication
12. Videsh Sanchar Nigam and other Corporate Bodies
13. Civil Aviation
14. Meteorological Department
15. Power sector
16. Oil Industry
17. Forest Departments
18. Irrigation and electricity boards
19. Medical and Health care
20. Railways, department of Tele Communications and Civil Industries

IV - Future Advancements
Under the liberalization business environment, increased global competition and rapid technological changes, it has become necessary to reorganize themselves to effectively respond to dynamic market conditions and to achieve faster response time, enhance customer satisfaction and improve business performance. It has been decided to reorganize Bangalore complex into following 6 strategic business units (SBUS) to realize their objective.

1. Military Radar's
2. Naval Systems
3. Military communication and EW systems
4. Telecom and Broadcast systems
5. Components
6. Export Manufacturing

Functioning of the SBUs
Each SBU will have independent resources of Development and engineering (D and E), manufacturing, Quality Assurance, Marketing, Finance and Personnel within itself to support its business operations. The intention here
is to equip each SBU with necessary infrastructure, provide resources and operational freedom the way they are available to other units of BEL.

Heads of each SBU will support to the executive Director and will be suitably empowered so that they are accountable for growth and profitability of the SBU.

Central Service Groups
Although the intention is to make each SBU self-sufficient, for economic and strategic reasons some functions will continue to exist as central service groups. The Heads of the Central Service groups will report to the executive Director. Relationship between SBUs, Central Service groups and corporate office.

The Heads of SBUs and Central Service groups will also seek necessary functional guidance and direction in respect of personnel ,Finance , D and E and marketing functions from D(P), D(F), D (R and D) and D (D and ms) respectively.
### BEL - Growth Profile For Five Years
(Rs. in million)

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<tr>
<td>1.</td>
<td>Sales</td>
<td>11988.7</td>
<td>14941.5</td>
<td>17153.3</td>
<td>19419.9</td>
<td>25080.2</td>
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<td>2.</td>
<td>Value of Production</td>
<td>12167.0</td>
<td>15432.9</td>
<td>17875.7</td>
<td>20299.8</td>
<td>25363.9</td>
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<td>3.</td>
<td>Profit Before Tax</td>
<td>702.1</td>
<td>1664.3</td>
<td>2199.1</td>
<td>2847.3</td>
<td>3861.6</td>
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<td>4.</td>
<td>Provision for Tax</td>
<td>165.8</td>
<td>585.0</td>
<td>647.0</td>
<td>850.5</td>
<td>1255.5</td>
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<td>5.</td>
<td>Reserves &amp; Surplus</td>
<td>3613.0</td>
<td>4448.3</td>
<td>5647.8</td>
<td>7385.4</td>
<td>9417.3</td>
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<td>6.</td>
<td>Working Capital</td>
<td>2558.9</td>
<td>3274.5</td>
<td>4551.9</td>
<td>5943.3</td>
<td>7051.9</td>
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<td>7.</td>
<td>Capital Employed</td>
<td>4568.4</td>
<td>5278.0</td>
<td>6448.2</td>
<td>7952.4</td>
<td>9374.0</td>
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<td>8.</td>
<td>Net Worth</td>
<td>4019.9</td>
<td>4912.5</td>
<td>6268.8</td>
<td>7771.2</td>
<td>9866.2</td>
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<td>9.</td>
<td>No. Of Employees</td>
<td>15618</td>
<td>14807</td>
<td>14177</td>
<td>13572</td>
<td>13750</td>
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Source: Office records of the study unit

### BEL - Manpower Strength For Five Years

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<td>15</td>
<td>14</td>
<td>13</td>
<td>14</td>
<td>11</td>
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<tr>
<td>Middle</td>
<td>58</td>
<td>56</td>
<td>55</td>
<td>54</td>
<td>52</td>
</tr>
<tr>
<td>Low</td>
<td>15545</td>
<td>14737</td>
<td>14109</td>
<td>13504</td>
<td>12404</td>
</tr>
<tr>
<td>Total</td>
<td>15618</td>
<td>14807</td>
<td>14177</td>
<td>13572</td>
<td>13750</td>
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Source: Office records of the study unit
Organization Chart of BEL

Mr. Y. Gopala Rao
Chairman & Managing Director

GM (TORQUE)
Mr. T. R. Prasad

Director (Other Units)
Mr. N. K. Sharma

GM (Ghaziabad)
Mr. R. R. Raghavendra

GM (Chennai)
Mr. K. Prakash

GM (Panchkula)
Mr. Anand Kumar

GM (Kotdwara)
Mr. R. Padmanaban

GM (Pune)
Mr. S. K. Kaura

Exec. Director (Hyderabad)
Mr. A. R. S. Reddy

GM (Machilipatnam)
Mr. K. Babu Rao

GM (Corporate Planning)
Mr. S. C. Khanna

Director (C&MS)
Col. S. Dewan (Retd.)

GM (National Mktg.)
Mr. K. Prakash

GM (Systems)
Mr. Krishna Gopal D.

Public Relations

Licensing

Director (Personnel)
Mr. V. Ammineedu

Exec. Director (Personnel and Administration)
Mr. M. Eswara Rao
<table>
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<tr>
<th>Position</th>
<th>Name</th>
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<tbody>
<tr>
<td>GM (Taloja)</td>
<td>Mr. I. V. Sarma</td>
</tr>
<tr>
<td>Director (Bangalore Complex)</td>
<td>Mr. Basavarajaiah</td>
</tr>
<tr>
<td>GM (Military Commn. &amp; EW systems)</td>
<td>Mr. V.V.R. Sastry</td>
</tr>
<tr>
<td>GM (Naval Systems)</td>
<td>Mr. A. Muralidhar</td>
</tr>
<tr>
<td>GM (Telecom &amp; Broadcast Systems)</td>
<td>Mr. D.A. Mohan</td>
</tr>
<tr>
<td>GM (Engineering Services)</td>
<td>Mr. S.C. Sharma</td>
</tr>
<tr>
<td>GM (Finance)</td>
<td>Mr. U. Vishnu Murthy</td>
</tr>
<tr>
<td>GM (Components)</td>
<td>Mr. PRKLN Sastry</td>
</tr>
<tr>
<td>GM (Military Radar)</td>
<td>Mr. Ashwani Dutta</td>
</tr>
<tr>
<td>GM (Personnel)</td>
<td>Mr. H.S. Bhadoria</td>
</tr>
<tr>
<td>Exec. Director (Information Systems)</td>
<td>Mr. R. Ramachandra Murthy</td>
</tr>
<tr>
<td>Director (Finance)</td>
<td>Mr. P.R.K. Hara Gopal</td>
</tr>
<tr>
<td>GM (Finance)</td>
<td>Mr. M.G. Raguveer</td>
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<tr>
<td>Director (R&amp;D)</td>
<td>Mr. S.K. Mehta</td>
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<tr>
<td>Exec. Director (CRL)</td>
<td>Mr. S.L. Prasad</td>
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<tr>
<td>Chief Scientist (CRL)</td>
<td>Mr. N.K. Khurana</td>
</tr>
<tr>
<td>Chief Vigilance Officer</td>
<td>Mr. C. M. Bhat, I.P.S.</td>
</tr>
<tr>
<td>Dy. Chief Vigilance Officer</td>
<td>Mr. M. Mutum</td>
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Fig: No-III-3

Source: Office records of the study unit