

Annexure-5

MANAGEMENT DISCUSSION AND ANALYSIS REPORT

(A) Industry Structure and Developments, Strengths, Weaknesses, Opportunities and Threats, Major Initiatives undertaken and planned to ensure sustained Performance and Growth:

(a) General outlook of economy, industry in which the Company operates, Government Budget, particularly the Defence Budget, market conditions and how these impact the Company, measures taken / action plan to protect the interest of the Company;

The Indian Economy is estimated to become fifth largest in the world as per World Economic Outlook (WEO) of October 2019. The Union Budget 2019-20, had articulated about India becoming 5 trillion USD economy by 2024-25. Given the challenges in Global Economies like trade tensions between the world's largest economies, protectionism etc., the Global output growth is estimated to be slower. As per Second Advance Estimates released by Central Statistics Office (CSO) in February 2020, the Indian economy growth is estimated to be 5% in 2019-20, compared to 6.1% in 2018-19. However, there is growth in macroeconomic stability of India for the last five years, but the challenge faced by the financial sectors in India has put an undue pressure on the Indian economy.

The Balance of Payment has improved due to higher capital flows by way of FDI and Foreign Portfolio Investment (FPI) to the country leading to increase in foreign exchange reserves (USD 302 billion in end March 2019 to USD 461.2 billion as on 10 January 2020). The Current Account Deficit (CAD) has been narrowing leading to reduction in external indebtedness and independent domestic policy.

The unprecedented and unforeseen crisis due to the virulent novel Corona Virus (Covid-19) has shaken the entire human kind across the world. However, due to Covid-19, the real impact on the Indian economy is to be seen in the near future as the situation is evolving.

The pandemic Covid-19 which started in China has affected the whole world and the economies are reeling under the lockdown of various Industries across sectors including Defence.

Defence

As per SIPRI report released in April 2020, the total World Military spending rose to USD 1.917 trillion in 2019 compared to USD 1.822 trillion in 2018 which is an increase of 3.6% compared to the previous year. This is the largest annual growth in Defence spending since 2010.

The United States continues to be the highest military spender in the world, followed by China, India, Russia and Saudi Arabia, with India as the 3rd largest military spender in the World.

In the challenging Geo Political situation, the Indian Union Budget in February, 2020 has allocated ₹ 4,71,378 Crores for 2020-21 for Defence, with an increase of 9.37% over the previous year of ₹ 4,31,011 Crores. The budget for Capital Expenditure has increased from ₹ 1,03,394 Crores in 2019-20 to ₹ 1,13,734 Crores in 2020-21, which is about 10% hike over the previous year.

The Capital Expenditure allocated to Air Force is ₹ 43,282 Crores, Army is ₹ 32,462 Crores and Navy is ₹ 26,688 Crores. Out of the total budget allocation, 59% of Air Force budget is for Capital Expenditure, Navy it is 54% and Army 18%.

The increase in capital budget for defence is not commensurate with the procurement plans of the defence forces and it may also impact the payments for the delivery of ongoing projects of the Defence forces. The Pandemic Covid-19 is likely to impact the Indian Defence Budget /Expenditure in the coming years.

Non-Defence:

Apart from its core Defence Business, BEL has ventured into several non-defence areas like Homeland Security, Smart City, Energy Storage Products, Solar, Space Electronics, Network & Cyber Security, Railways & Metro solutions, Composites and Software.

Homeland Security

The Homeland Security market in India is spread across Central/State Governments, Government Entities including PSUs and Private Sector Organizations. A significant market opportunity exists in Police Modernization, Critical Infrastructure Protection, Border Management, Counter Terrorism Activities, Urban Area Security, Ground Transportation, Port & Maritime Security, etc. Prevailing internal security concerns due to terrorist activities & crime, data thefts, remote monitoring needs for centralized command & control, Asset Protection & Disaster Management, growth in public infrastructure, increased IT spending, various Government initiatives, increase in security spending are boosting demand for the Homeland Security market in India.

The total budget allocation of Union Home Ministry for 2020-21 for the Police Forces (which includes the Central Armed Police Forces and Delhi Police) is ₹ 1,05,244 Crores against ₹ 1,03,204 Crores in 2019-20, a hike of 2%. Out of this budget, ₹ 77,887 Crores has been allocated for the Central Armed Police Forces.

Smart City

Under the Smart City Mission launched by Government of India in June 2015, 100 smart cities have been selected and all the 100 cities have incorporated Special Purpose Vehicles (SPVs), City Level Advisory Forums (CLAF) and appointed Project Management Consultants (PMC) to appraise, approve, implement, manage, operate, monitor and evaluate the projects. The 2020-21 Budget has proposed for setting up of 5 new smart cities, which will be full-fledged new development similar to Gujarat International Finance Tec - City, Special Economic Zones, etc.

The 2020-21 Budget has not mentioned any particular budget increment for the Smart Cities Mission. The 2019 budget had allocated ₹ 6,450 Crore for the Smart Cities Mission for 2019-20 against ₹ 6,169 Crore in 2018-19, a 4.5 % hike than the previous year. As per reports, as much as 5,151 smart city projects with a cost of ₹ 2 Lakh Crore are in various stages of implementation among the 100 smart cities since the inception of Smart City Mission.

The new Strategic Business Unit headed by a General Manager, which was formed exclusively to address the Smart City and Homeland Security Business has made significant achievement by bagging several orders for Homeland Security and Smart City Projects which are under different stages of implementation.

Energy Storage Products

There are substantial business opportunities in the alternative power storage segment in the coming years due to huge requirement of high energy, maintenance free batteries for defence and strategic applications and also the policy interventions by GoI towards E-vehicles.

Among the mature storage technologies, Lithium-ion batteries are the most versatile and efficient storage devices and find usage in a wide spectrum of applications in both defence and non-defence areas. The Electric Vehicles (EV) market in India has gained momentum after several policy initiatives like the National Electric Mobility Mission Plan (NEMMP), Faster Adoption & Manufacturing of Hybrid & EV (FAME) and FAME 2. As per report, the market for Lithium-ion battery in India is expected to grow at a CAGR of 35% in the next 3-4 years.

In addition to Lithium-ion opportunities, Fuel Cell technology-based Energy Storage Products are also projected to dominate the future energy storage markets globally as well as in India.

Seeing the opportunity for Li-ion Cells and emerging market for Fuel Cells, BEL has identified Li-ion Cells/Batteries and Fuel Cells as one of the focus areas. Towards this, BEL has created a dedicated micro SBU to address the business in a focused manner and further expand its presence in the Energy Storage Products segment by manufacturing of Li-ion Cells and development / manufacturing of Fuel Cells.

Solar

The Government has set an ambitious target of generating 450GW of renewable energy by 2030. This includes a target of generating 175GW of renewable energy by 2022 with a target of 100GW from Solar Power. However, the GoI is confident of achieving 225GW of renewable energy by 2022 breaching the

set target of 175GW. In the Budget for year 2020-21, ₹ 2,516 Crores has been earmarked for solar power which includes both grid-interactive and off-grid projects.

BEL has scaled up its operations from a Cell/Module manufacturing to execution of Solar Power Plant projects under Engineering Procurement Construction (EPC) / Developer mode. BEL has created a new Micro SBU to give a focused approach to target the requirements of Solar Business. In near future, this segment is expected to contribute to BEL's business on a continuous basis.

BEL has also been shortlisted by ISRO for manufacturing of Multi Junction Solar Cells for space application. The plant with a capacity of about 60,000 multi junction Cells per annum will be setup by ISRO and complete manufacturing will be operated by BEL.

Space Electronics

ISRO has opened up opportunities for manufacturing of 'Polar Space Launch Vehicles' (PSLVs) and Small & Micro Satellites, for the Indian Industry. The Global requirement for small satellites is expected to touch around 500 numbers per annum. ISRO has ambitious plans to increase the number of Satellite launches on an average of about 18 satellites per annum from the year 2020-21 onwards. In commensurate with the plans of ISRO, the Department of Space (DoS) has been allocated a budget of ₹ 13,479 Crores for year 2020-21 in comparison to ₹ 11,538 Crores in the previous year. In addition to this, ISRO has approval for launch of 30 PSLVs and 10 Geo Synchronous Satellite Launch Vehicles (GSLVs) in next three years.

BEL is one of the major players in ground segment of Satellite Communication and desires to enter into Space Electronic Systems, manufacture of Small & Micro Satellite and address Launch Vehicle segment jointly with Indian private industry. BEL has long term objective of becoming a prominent player in Space Based Assets and Payloads. During year 2019-20, BEL has responded to New Space India Limited (NSIL) EoI for productionisation of PSLV for ISRO in consortium and also expressed its interest for participation in productionisation of Small Satellite Launch Vehicle (SSLV) for ISRO.

BEL has qualified as an industry partner of ISRO for Assembly, Integration and Testing (AIT) of satellites. During this year, BEL has completed Satellite AIT of three RISAT satellites at ISRO. BEL has collaborated with ISRO and has come out with new products like next generation Indigenous Receivers for Positioning and Navigation (IRNSS), GSAT Terminals, LTCC based Substrates and High power TWTs, which have usage in Defence, Government Services and Paramilitary Applications. BEL is jointly working with ISRO for supply and commissioning of various types of Satellite Networks and HUBs for SatCom Applications.

Network and Cyber Security:

With the advancement of digital technologies and their use in almost all areas, businesses like e-Governance, defence, banking, etc have become vulnerable to cyber attacks. To address the above issues, Cyber Security solutions in the areas of Cyber Warfare, Espionage, National Defence, Protection of Intellectual Property, Data Security for employee/ customer/personal information are being developed. The global Cyber Security market is expected to reach about USD 190 billion by year 2025 and Cyber Security market in India is estimated to be about ₹ 30,000 Crores for next 3 years.

BEL is working in the domain areas of Network Elements and Security, Computing Elements, Encryption, AI & Data Analytics, Security Management, Digital Identity Solutions, Cyber Forensics, Security Services, Secure Network Segregation Solution etc.

BEL has completed the implementation of projects like Security Analytics Centre (SAC) and developed products like Data Diode, PKI, Secure Storage Solutions, Secure Computing Devices, etc.

BEL is empanelled by Indian Computer Emergency Response Team (CERT-In) for providing Information Security Auditing Services. BEL has obtained EAL4 certification for one of its products. During the year, BEL has signed MoUs with several reputed Govt / Private organisations including Academia for cooperation in the field of Cyber Security.

Railways and Metro

The total capital outlay for Indian Railway (amount spent on asset creation) for 2020-21 is ₹ 1,61,042 Crore which is 3% higher than the 2019-20 (₹ 1,56,352 Crores). There are substantial business opportunities in the Rail and Metro business in India. As per the reports, around 34 Metro Rail projects are under construction stage including 9 newly approved projects in different parts of India.

The modernization and new projects like National Common Mobility Card (NCMC) compliant Automatic Fare Collection (AFC) Gating system for Metro's, Indian Computer Based Train Control/Automatic Train Supervision (ATS), Real Time Information System (RTIS) for Indian Railways, LTE based Mission critical communication networks for railways, Unmanned Railway Crossing system, Composite Panels for Rail and Metros, etc. are some of the key areas in which BEL is pursuing for business.

BEL is collaborating with various Public/Private organizations in the area of ATS System, Mission critical Communication System, Composite panel etc. NCMC compliant AFC gating system executed by BEL will be implemented across all modes of transportation i.e. Metro, Trains or Buses in phased manner. Also, having done the pilot implementation of RTIS project, BEL is keen to participate in Phase-II implementation of RTIS project for pan India coverage.

Composites

Composites are used for the manufacture of various products in Aerospace & Defence, Wind Energy, Transportation, Marine Applications etc. As per the reports, the Global Composites market size is expected to grow from USD 90.6 billion in 2019 to USD 131.6 billion by 2024. The demands for lightweight, high-performance, corrosion resistance, long life are some of the key factors which are influencing the growth of Composite business.

BEL is planning to address the Composites structure requirements of Shipyards, Aero structures, Railways & Metros, Land equipments, etc.

BEL has setup facilities for Resin Film Infusion (RFI) and Vacuum Assisted Resin Transfer Molding Process (VARTM). BEL has also tied up with CSIR lab, Academia for consultancy and development of Composites structures. Composite panels are being planned for development as per the requirement of Shipyards and Railways.

Software

The defence technology is transiting from Platform Centric Warfare to Network Centric Warfare. In this transition, Software is becoming a crucial piece of weaponry in the modern defence system. Advance software systems and embedded software technologies play a vital role in modern warfare.

India is one of the leading software development center in the World and Indian IT Industry is growing at a CAGR of 10.71%. As per reports, the Indian IT Industry comprising of Software Products, IT services, Engineering and R&D services, ITES/BPO, Hardware and e-commerce is expected to grow to USD 350 billion by 2025. Majority of the revenue comes from exports of software and services.

BEL is pursuing Business opportunities with potential customers like Para-military Forces, Special Forces, State Governments, other non-defence customers etc in addition to existing Defence customers. To address the Software business opportunity in a focused manner in both Indian and export market, a dedicated General Manager has been appointed.

Apart from core defence segments, opportunities with respect to Homeland Security, e-Governance Projects, Smart Cities, Digital Transformation Projects, Software Simulators, Software Assurance Services are also being focused.

Focused Approach for New Areas in Defence

To give a focused approach to upcoming areas in Defence & Aerospace sector, BEL has ventured into Unmanned Systems, RF and IR Seekers, Missiles, Rockets, Glide Bombs & Ammunition.

Unmanned Systems

Military applications like reconnaissance, intelligence gathering, detection of threats etc. are migrating

from Manned Systems to Unmanned Systems, due to criticality of missions, avoidance of risk associated with International norms and value for human life.

The Indian UAV segment offers an overall opportunity of about USD 5 billion during the LTIPP Plan period ending by 2027. Opportunities in Unmanned Systems include Unmanned Aerial Vehicle (UAV) systems, Unmanned Ground Vehicles (UGVs) and Unmanned Underwater Vehicles (UUVs) & Unmanned Surface Vehicle (USV) systems.

BEL has been addressing the UAV/UGV/UUV/USV requirements of the Indian Defence / Non-Defence segments by partnering with DRDO / foreign OEMs/ Indian Academia/ Startups etc. BEL has been working on the Payloads (like EO, Communication, ESM etc.) and Ground Control Station requirements of UAVs and also developing capabilities in Drone Guard Systems. BEL has started a Micro SBU to address the opportunities of Unmanned Systems for both Defense and Non-Defence customers.

RF and IR Seekers

The next generation of SAM and other AD Missiles are based on active/passive seeker technologies, which uses RF seekers and IR seekers for homing on to the targets. The requirements for RF and IR Seekers are derived demands arising out of procurement of various Next Generation Missiles.

As per the defence acquisition plans of India and friendly countries, opportunities for RF and IR Seekers is about ₹ 28,000 Crores in next 10 years.

BEL is involved with DRDO for concurrent absorption of technology for further engineering and productionisation of RF and IR Seekers. These seekers will be a key differentiator in all future Indigenous AD and other Missile Systems. BEL manufactured and supplied RF seekers are already successfully used in the flight trials.

Missiles, Rockets, Glide Bombs & Ammunition

Make in India initiative of MOD, has given an opportunity to Indian Industry to take up indigenous development and manufacture of identified missiles, projectiles and related ammunitions.

As per the defence acquisition plans of India, opportunities for this segment is about ₹ 10,000 Crores in next 10 years.

BEL is pursuing opportunities under Make II category and other procurement category of DPP. Along with this, BEL is also exploring opportunities in manufacture of propellants for Defence/Space segments. BEL is partnering with Academia, R&D Institutes, Start-ups etc. as knowledge/ technology partners.

BEL is already engaged in the development and manufacture of Missile Electronics and parts, Ammunition fuzes etc. BEL is pursuing several MoD and DRDO (DCCP) opportunities which are at different stages of procurements. Apart from this, BEL is also creating necessary infrastructure for manufacture of missiles, glide bombs, rockets and its related parts.

(b) Industry Structure and Developments

Presently, India is the second largest importer of defence equipment with majority of its defence needs being met through imports. Government of India aims to develop a strong self-reliant domestic industry in the defence sector with substantial participation from private sector including MSMEs and Start-ups to reverse the trend of imports.

In this regard, the Government has taken several initiatives like "Make-In-India" program, creation of an eco-system for development of technologies through innovation by MSMEs / Start-ups, etc. With the support of the Government, Indian industry is expected to move up in the value chain and deliver quality products, systems and services to the Defence forces. Government has promulgated a draft defence production policy that aims at increasing defence production to Rs 1,70,000 Crores by 2025.

MoD has introduced the Strategic Partnership model (SP) for the Indian private sector, as part of DPP 2016. The model aims to progressively build indigenous capabilities in the private sector to design, develop and manufacture complex weapon systems and platforms.

To promote indigenous defence manufacturing, Government has undertaken initiatives like liberalisation of Industrial Licensing, development of Defence Corridors, funding for Innovation in Defence and Aerospace through iDEX / DIO, continuous updation of DPP, thrust on exports, etc. MoD has released a simplified Make-II procedure to help import substitution and promote Innovative solutions. Suo-Moto proposal can also be submitted under Make-II category.

Foreign Direct Investment (FDI) up to 49% is allowed through automatic route and above 49% under Government route wherever it is likely to result in access to modern technology.

DRDO developed technologies are now made available on non-exclusive basis to Indian industry including private sector against payment of ToT and Royalty fees. Also, DRDO has come out with a revised Policy and Procedures for Transfer of Technology to Industry during October 2019.

Two Defence industrial corridors in Uttar Pradesh and Tamil Nadu is being established by the Government. The Uttar Pradesh Defence Corridor will have six nodes at Agra, Aligarh, Chitrakoot, Jhansi, Kanpur and Lucknow. The Tamil Nadu Defence Corridors will have five nodes at Chennai, Coimbatore, Hosur, Salem and Tiruchirappalli. An investment plan of about ₹ 3,100 Crores and ₹ 3,700 Crores has been announced for Tamil Nadu and UP corridors respectively by Ordinance Factories, DPSUs and Private Companies.

The procedure of 'Make-I' has been simplified and a new 'Make-II' program has been introduced by Government that will help MSME and Startup companies to integrate into defence production. BEL is also participating in many of the "Make II" programs of defence services.

Under these changing business scenarios, BEL is focusing on enhancing its interaction levels and building long term relationships with emerging Strategic Partners, Users and other key stake holders in the Indian defence industry.

(c) SWOT Analysis

Strengths

- Established defence electronics player in India.
- Defence PSU with a good image, reputation and work ethics culture.
- Strong multi layered in-house R&D for technology and new product development.
- Committed work force with good infrastructure for manufacturing and quality assurance.
- Well established systems and procedures including companywide ERP system.
- Decades of experience resulting in excellent domain knowledge and core competencies in defence electronics.
- Wide product range with strong product support network.
- Strong relationship with Armed forces, defence R&D labs and Government agencies.
- Loyal customer base.
- Agility in diversification initiatives.
- Active learning from collaborators.
- Expertise and experience in executing large & complex System Integration Projects & Turnkey Solutions.
- Consistently profit making.
- Long term commitment to customers.

Weaknesses

- Gaps in some of the critical technology areas.
- Dependence on defence market.
- Time to Market – High.
- Dependence on DRDO for technology in certain segments.
- Depleting reserves.

Opportunities

- Growing defence and security needs.
- Government's emphasis on Make-In-India for manufacture of defence equipments.

- Growing defence budget allocation towards modernization, upgrade programs and Maintenance Repair & Overhaul.
- Increased impetus on modernisation of central paramilitary and police forces.
- Withdrawal of OEMs from China as a manufacturing base.
- Growing market for allied non-defence areas such as Homeland Security, Smart City, Space Electronics, Energy Storage Products, Network & Cyber Security, Composites, Solar based power plants, Railways etc.

Threats

- Rapid changes in technology in defence.
- Difficulty in sourcing of few critical and denied technologies.
- Policy interventions favoring Private sector.
- Manifold increase in competition from Indian Private industry and foreign OEMs including their JVs in Defence sector.
- Procurement of electronic systems under Strategic Partnership Model.
- Impact due to COVID like Pandemics.

(d) Major initiatives undertaken/planned, including strategy, goals and targets set by the top management, to ensure sustained performance and growth of the Company

The Company has undertaken the following major initiatives to ensure sustained performance and growth of the Company:

(i) Strategic alliances in emerging businesses through Co-development, Co-production and Manufacturing ToT:

The Company is working in many strategic areas of national importance such as Weapon systems, modern Land based AESA Radars, Naval Radars, Airborne Radars, Next Generation Electronic Warfare Suites and Counter Measure Systems, Air Defence Systems,

Unmanned Systems for Land, Air & Surface and Under-Water applications, Anti-Submarine Warfare Systems, Software Defined Radio, C4I Systems, Passive Night Vision Devices, Multi-sensor Stabilization Systems, Arms and Ammunitions, Transportation Solutions for Railways and Metro, Composite Products for Land, Marine & Avionics segments, Artificial Intelligence & Robotics, Space Electronics & Launch Vehicles, Solar, Medical Equipments and related solutions, Energy Storage Products etc.

Many strategic alliances have already been formed and more partnerships are being pursued with Defence laboratories, Ordnance Factory Board, DPSUs, Academia, Startups, niche technology companies and reputed global and Indian companies/agencies for addressing the emerging Defence and Non- defence businesses including exports.

Some of the products & systems identified and being pursued for alliances for Co-development, Co-production and Manufacturing ToT include Surface-to-Air Missile (SAM) Systems, RF/IIR Seeker, Air Defence Radars (Land and Naval based), Navigational Complex System, Sonar Systems, Next Generation Night Vision Devices, Gun Upgrades/New Gun Programs, Explosives, Ammunitions, Inertial Navigation Systems, High Power Lasers, Tethered Unmanned Aerial Vehicles and Swarm UAVs, Remotely Operated Vehicle (RoV), Counter Measure Systems, Electronics Systems for Futuristic Infantry Combat Vehicle (FICV), Satcom Terminals, Composite products, Rail & Metro Solutions, Li-ion Cells, Medical Equipments etc.

(ii) Joint Ventures (for existing / emerging business areas):

BEL has been continuously exploring opportunities for establishing Joint Ventures / Special Purpose Vehicles with reputed companies in complementary technology / Strength areas to bridge technology gaps and also to scale up the existing areas as well as enter into emerging business areas.

The Joint Venture BEL-THALES Systems Limited (BTSL) is formed between BEL and Thales, France with an objective to engage in design, development, marketing, supply and support of civilian and select

defence radars for the Indian and global markets. Benefitting from the confluence of work culture and Technology / manufacturing support of the Parent Companies, the JV has imbibed the best practices of both parent organisations and is growing into a centre for development, evolution and customization of products and as a trusted supplier. BTSL is presently engaged in the co-development of a Multi-Target Tracking Radar with Thales Netherlands to address the Indian weapon systems projects as well as the global requirements. BTSL has successfully customized and deployed a FM based Passive Radar Demonstrator in Bangalore. A well-equipped Integration and Verification facility for high end avionics systems setup is geared to fulfill the offset sourcing in the defense market. The Company is also involved in providing technical and product support for Air Traffic Management Radars.

BEL is in discussion with an Israeli OEM to establish a new Joint Venture Company to provide Product Life Cycle Support for the Weapon System Programs.

Technology Updation and R&D Challenges

Core Technologies: Core technologies required for developing products and solutions for the Defence Forces are often not readily available. These need to be developed and constantly upgraded for building solutions with a competitive edge.

Lock in for Proprietary Technologies: While it is inevitable for the defence forces across the world to depend on proprietary technologies, getting locked in to a single source for the technologies and solutions is a challenging situation for them.

Measures

To overcome the challenge of continuous upgrade w.r.t underlying core technologies for all products and solutions across BEL, a 3 tier R&D structure is put in place. At the topmost tier, two Central Research Laboratories (CRLs) located at Bengaluru and at Ghaziabad are engaged in blue sky research for development of core technologies in the areas of Radio Frequency and Microwave, Embedded Computing Systems, Radar Signal Processing, Network Centric

Software, Sensor Signal Processing, Very Large Scale Integration, Smart Computing Systems, Network and Data Fusion and Electronic Warfare etc. These are then engineered into core technology modules and products by the Product Development and Innovation Centre (PD&IC), which forms tier 2. This is complimented by BEL Software Technology Centre (BSTC) for related software modules. At the third tier, Development and Engineering divisions operating at all Strategic Business Units liaison with the customers for understanding their requirements, mapping them to technical specifications and developing products/solutions incorporating the core technology modules developed through the higher tiers, i.e CRLs, PD&IC and BSTC.

To overcome the challenge of lock-in to proprietary technologies, wherever feasible, the Company develops technology modules/ solutions based on standard protocols which can be evaluated using standard test & measuring instruments. Even when a given Technology Module/ Product/ Solution is Built to Specs (tailor made for the defence forces), they are developed with standard interfaces so that they can be used as plug and play modules in a larger system. Even within the solution developed, standard interfaces, modularity and scalability is ensured. This safeguards against the lock-in situation and ensures that the system developed is easily maintainable. Further, wherever a subsystem or a component is procured, multiple sources for this subsystem/ component are created to safeguard company from getting locked in.

R&D Initiatives and Achievements

Following are some of the new initiatives undertaken by BEL in the areas of R&D and technology development during the year 2019-20:

- BEL has initiated development of several Artificial Intelligence based products some of which are: "Object Detection and Tracking", "Social Network Analysis", "Robotic Surveillance Platform", "Human Face Recognition".
- Air Defence Fire Control Radar that will replace existing Fire Control Radars.

- Long Range Surface to Air Missile (LRSAM) is an Indo-Israeli surface-to-air missile, designed to defend against any type of airborne threat including aircraft, helicopters, anti-ship missiles, UAVs, ballistic missiles, cruise missiles and combat jets. Ship launched Long Range Surface-to-Air Missile (LRSAM) has been successfully test fired from a warship off the coast of Odisha.
- More than 71 Technical Papers were published by scientists and R&D engineers of BEL in various national and international Journals/Seminars/Conferences.
- During the year 2019-20, BEL has filed for 160 IP applications (patents / copyrights) in various areas of technology. Three patents have been granted to BEL in the year 2019-20.

Some of the new initiatives undertaken by Company in collaboration with academia are as follows:

- Design and development of nano UAV (Insectocopter).
- Autonomous quad rotor drone for operating in GPS denied environment.
- Cooperative spectrum sensing algorithm development.
- Automatic speech recognition for border languages.
- Voice recognition for pilots for identification of false/deceptive targets.
- Game theory based interception, AI based Multi Sensor Fusion, Geo referencing of UAV image/ video.
- Image analysis based identification, Thermal image extraction & classification, Target size & distance using photogrammetry, tracking of static/moving object UAV.
- Development of AI model for real-time detection, Tracking and Classification of human/vehicle activities from video stream.

Specific areas in which R&D was carried on and benefits derived as a result of the activities are as follows:

Like every year, several R&D projects were taken up by BEL in 2019-20 and several were completed in

specific business segments/ areas. These include R&D projects in major segments like Radars & Weapon Systems, Communication Systems, Naval Systems, Electronic Warfare & Avionics, Air Situational Warfare, Tank Electronics, Electro Optics and Laser Systems and commercial segment. The benefits derived are in the form of major share of revenues generated by the Company in the above business segments. Indigenous R&D typically leads to more than 80% of the Company's turnover. Besides, several technology modules have been developed some of which have resulted in import substitutions, thereby reducing the import bill. Some of the BEL developed solutions have also resulted in export orders received by the Company.

Details of Major accomplishments in equipment and components area:

- R&D projects undertaken by BEL which have resulted in export orders are Coastal Surveillance System for Maldives, Coastal Surveillance System for Seychelles, Weapon Locating Radar for Armenia and COMNET for Guinea.
- R&D projects which have fetched considerable revenues for the Company (both Defence and non-Defence segments) include LRSAM, Train Simulator for Mumbai Monorail, System for High Altitude Area, National Common Mobility Card Based Auto Fare Collection Gate, Systems for Low Intensity Conflict, Ship-borne System, IEWS Upgrade, Upgraded stabilised optronix Platform, Real Time Train Information System, Missile Data Link Unit Mk II, CDMA Based wireless communication system, Instant Fire Detection and Suppression System, Digital flight control computer, Multi-Purpose Weapon Sight, Multi-Function Radar and Command and Control Unit for Akash-NG, X Ray Baggage Inspection System.
- Technology Modules and subsystems developed indigenously, which have resulted in import substitution are dip brazed chassis for flight control computers, LNAs and Data Processor for radars, Maintenance and Training Support Device (MTSD), Medium Wavelength Infra-Red (MWIR) Zoom Lens for Thermal Imager (TI) Sights, High power

Digital Dual Transmit- Receive Unit (DTRU) and Dual Receive Unit (DRU) for Air Surveillance Radar, Compact Tracking Radar (CTR), Multi-Function Console (MFC) for Radar, Satellite On The Move.

(e) Diversification / Expansion Plans:

As a diversification strategy, the Company has been exploring opportunities in allied defence and non-defence areas for growth, leveraging its strengths and capabilities acquired in the defence electronics domain. In the past 4-5 years, the non-defence portion, on an average (exception being in 2018-19 due to EVM/VVPTs) in company's business is about 15-20% of total turnover. This year company has about 18% of turnover from non-defence segment. The company aims to achieve revenues of about 20-25% of company's turnover from the non-defence business in the coming years.

The Company has been putting continuous efforts and focus to enter and address several new areas in both defence and non-defence for further expanding its business in new markets and sustaining the growth. Some of the areas being focused upon by BEL in defence include – Next Generation Weapon Programs including critical parts in RF, EO and other Electronic parts, Airborne Radars, Arms & Ammunitions and Explosives, Unmanned Systems, Aircraft Integration, Night Vision Devices, INS solutions for various Platforms, Helmet mounted Display Systems, Counter Measures Systems for Airborne Platforms, Composites etc.

Some of the areas being focused upon by BEL in the non-defence include - Air Traffic Controller Radars, Space Electronics, Space Launch Vehicles, Space grade Solar Cells, Satellite Assembly & Integration, Railway and Metro Solutions, Software, Electric Vehicles (Li-ion Cells, Fuel Cells, Charging Stations, etc), Homeland Security and Smart City Businesses, Smart Meters, Healthcare electronic equipments to combat COVID-19 situation.

BEL has successfully diversified into Electronic Fuzes, Critical parts for Weapon Programs, Light weight Composite Shelters & Masts, Homeland Security & Smart Cities, Network & Cyber Security, Rail & Metro solutions (Real time Train Information System,

Automatic fare Collection and Gating system for Metro), Intelligent Traffic Management Systems, Energy Storage Products, Solar Power Plants, Cells & Modules, Satellite Assembly & Integration, X-Ray Baggage Scanners (X-BIS) etc.

BEL also continuously strives to expand its business by capturing new customers in the existing geographical markets as well as new geographies for its proven products, Systems and Solutions. BEL has ventured into new Business Models like Government Owned Company Operated (GOCO Model), OPEX Model etc to expand its business by capturing new Customer segments. BEL is striving to exploit its dual use technologies for expanding the market as well as customization of its products / solutions to meet the new customer segments / geographical areas, especially in the export markets.

BEL is leveraging on its new International Marketing offices to expand the reach of its products and services to the new Markets and also explore Offset Opportunities. BEL is also forging partnership with other PSUs/ Industry players for quickly expanding the geo spatial reach through resource sharing.

(f) Specific Measures on Risk Management, Cost Reduction and Indigenisation:

1. Risk Management:

BEL operates in businesses which involves exposure to various types of risks such as dynamic customer requirements, technology /security considerations, research & development, long duration for equipment evaluation and trials, timely on-site product support requirements in adverse conditions, etc.

In order to address these risks comprehensively, BEL has established an Enterprise Risk Management (ERM) framework, across the company. The deployment of ERM is based on the Risk Management Policy released with due approval of the Board.

The Risk Management Policy outlines Risk Management Structure, Scope & Objectives, Focus Areas, Roles and Responsibilities of Risk champions and other concerned

personnel in the company. A comprehensive framework for Risk Identification, Evaluation, Prioritization and Mitigation of various risks associated with different areas such as Technology, Market, Security including Cyber Security, Operations, Finance, Human Resources, etc are also defined in the Policy.

The Risk Management framework of BEL has three tier Structure, with the Board of Directors (BoD) (represented by Risk Management Committee (RMC) of the Board) at the Apex Level and the Corporate Risk Management Committee (CRMC) at Corporate Level and Unit Risk Management Committees (URMCs) at the SBUs/Units /R&D Centres.

The Company level risks are monitored by CRMC which is headed by a "Functional Director" and senior management of corporate at General Manager Level are its members.

URMCs are constituted at each of the Units/SBUs/R&D centres for effective management of Risks. The Unit Risk Management Committees (URMCs) are headed by the respective SBU/Unit Heads/R&D Centre Heads and coordinated by respective Unit/R&D Centre Risk Champions. URMCs focus on risks specific to their area of operations.

URMCs carryout risk assessment in their respective operational areas, as an ongoing activity and every quarter conduct a formal review of risks and suggest mitigation measures. The URMCs further prioritize and grade their risks as per their assessment in terms of probability and impact. The top risks are reported by URMCs to CRMC every quarter. CRMC analyses the Risk Register received from the URMCs and also Company Level Risks.

The risks having Company-wide impact, which needs review and advice, are placed before RMC. After review and recommendations by RMC, these risks are addressed by introducing suitable changes or introduction of policies and processes if required. Risks, that may have significant impact on company's business operations and may threaten the existence of the Company, are further referred by

RMC to the Board. The Board would further review the risks and gives approval for appropriate mitigation measures. These mitigation measures are implemented and further reviewed by RMC for compliance and the implementation status reported to the Board.

The risks, which may have high potential of impact on major projects, investment proposals etc, are referred to CRMC for detailed review and analysis and for mitigation measures. Major Project proposals and those having strategic importance mandatorily include risk analysis reports as part of their proposals while seeking approval from the approving authority. This is to enable the approving authority to take informed decisions.

Some of the Risk Mitigation measures implemented at BEL include in-house R&D to develop critical technologies, hedging to overcome any unforeseen FE variations, business diversification to maintain planned growth rates, partnerships for co-development & addressing new business opportunities, Indigenization, comprehensive vendor development and evaluation process, etc.

To have a uniform understanding of the ERM in the company, all new members of the CRMC, URMCs and other Senior Executives are trained in ERM on a continuous basis. The ERM training programs are periodically organized by Corporate Human Resources Department. ERM training is included in the calendar program of BEL Academy of Excellence (BAE), Bengaluru, as a continuous activity.

BEL has taken up revision of Risk Management Policy for the company, taking into consideration the changes in the business environment. The revised policy will be released after necessary approvals.

2. Cost Reduction:

In view of increasing competitive environment for electronic products both in civil & defence, BEL has adopted cost reduction strategy as one of the thrust areas. "The Cost Reduction" Task Forces are set up in all the Units/SBUs with members from Cross Functional Areas. The Task Forces identify & take up projects and set target

for achieving cost reduction. Cost reduction activities concentrate on both manufacturing & non-manufacturing areas and encompass all facets of business.

3. Indigenization:

BEL has always been striving to attain self-reliance through indigenization efforts and thereby meet the strategic needs of the nation. The indigenization activity covers development initiatives through in-house R&D, collaborative R&D & joint development with national labs, academic institutions etc. To give further thrust on indigenization, the Company has set up an integrated state-of-the-art Product Development & Innovation Centre at Bengaluru. With all these efforts, around 79% of turnover was generated from indigenous technology during the year 2019-20 marching towards attaining self-reliance in strategic electronics.

(B) Internal Control System and its Adequacy:

BEL has a robust system of internal controls in place. It has documented policies and procedures on Purchase, Sub-contract, Works contract, Accounting, HR, IT and Security, Sub-delegation of Powers, etc. covering all financial and operating functions, and revised in tune with the changing times. These controls have been designed to provide a reasonable assurance with regard to maintaining of proper accounting controls for ensuring reliability of financial reporting, monitoring of operations, and protecting assets from unauthorized use or losses, compliance with regulations, etc. BEL has implemented File Life Cycle Management System (FLM) for online processing and approvals of procurement and other proposals, which facilitates complete transparency, accountability, protection and security of the information/files. Elaborated guidelines for preparation of accounts are followed consistently for compliance with Indian Accounting Standards (Ind AS) and Companies Act, 2013.

BEL has implemented company-wide ERP system (SAP) with centralised deployment. Governance Risks and Compliance (GRC) Access Control module has been implemented as the primary means of addressing user access risks by embedding preventive rule based checks while assigning authorisations to business transactions.

Authorisations to users are given based on principles of Segregation of Duties and Least Privilege. Risk rules have been configured in the system in several business processes like Finance, Procure to Pay, Order to Cash, Material Management, HR and Payroll. Risk analysis reports are regularly run to ensure that processes are under control. Additional control in the form of biometric fingerprint authentication for critical transactions is also in place. Audit logs for all changes in roles and authorisations are maintained.

BEL has its own Internal Audit Department commensurate with the size of its operations, with teams of professionally qualified personnel who conduct regular and comprehensive internal audits to ensure that all checks and internal control systems are in place. Besides, the Company has sub-committee of the Board viz. Audit Committee (AC) to keep a close watch on compliance with Internal Control Systems. Also, being a Government Company, BEL is subject to Audit by Comptroller & Auditor General of India (C&AG).

BEL's Internal Audit teams are located at major manufacturing units and Corporate Office of the Company which carry out audits as per risk-based Annual Audit Programme approved by Audit Committee of the Board. All the Internal Audit teams submit audit reports to their team leaders and after considering the Auditees' replies / action taken reports, team leaders submit reports of significant issues observed during audit to Head of Internal Audit on periodical basis. Head of Internal Audit submits his/her reports to Company's Management at various levels for corrective actions and finally submits report to the Audit Committee of Board indicating status of compliance with well-established internal control systems of the Company and plan for mitigating the key risks associated with major activities of the Company.

BEL's Internal Audit checks the adequacy and effectiveness of internal control system through regular audits, system reviews, process reviews, data analytics, etc. and provides assurance on compliance with the legal and regulatory requirements, and internal policies and procedures of the company. Functioning of Internal

Audit as well as Internal Control systems are periodically reviewed by Board-level Audit Committee. The Audit Committee of the Board of Directors, comprising Independent Directors, regularly reviews the audit plans, significant audit findings, adequacy of internal controls, and compliance with accounting standards & policies from time to time and issues directives for compliance to further strengthen the internal control system keeping in view the dynamic environment in which the Company is operating.

The Company continues its efforts to align all its processes and controls with global best practices, to assure the highest level of Corporate Governance.

(C) Financial/Operational Performance:

1. Strategy & Objectives:

The main objectives of the financing strategy of your Company are to generate adequate internal resources for profitable growth, to give value for money and create wealth for shareholders, to maintain highest credit rating and to build in risk mitigation strategies in the business processes to minimize exposure to financial risks.

2. Performance Highlights:

(₹ in Lakhs)

Particulars	Year ended 31 March 2020	Year ended 31 March 2019
Revenue from operations	12,92,111	12,08,460
Earnings before interest, tax, depreciation and amortization (EBITDA)	2,73,013	2,86,208
EBITDA Margin (EBITDA/ Revenue from operations)	21.13%	23.68%
Profit After Tax	1,79,383	1,92,729
No. of Days Inventory/ Value of Production	117	136
No. of Days Trade Receivables/Turnover	195	166
Current Ratio	1.45	1.52
Debt Equity Ratio	0.001	0.004

3. Analysis of Financial Performance of 2019-20:

- Turnover registered a growth of 6.94% from ₹ 11,78,922 Lakhs in 2018-19 to ₹ 12,60,776 Lakhs in 2019-20.
- Value of production has increased from ₹ 11,92,142 Lakhs in 2018-19 to ₹ 12,34,833 Lakhs in 2019-20. Increase of 3.58%.
- Turnover per employee has increased from ₹ 122.65 Lakhs in 2018-19 to ₹ 135.87 Lakhs in 2019-20.
- PAT to Turnover Ratio is 14.23% in 2019-20 as compared to 16.35% in 2018-19.
- Net Worth has increased from ₹ 9,01,891 Lakhs in 2018-19 to ₹ 9,85,294 Lakhs in 2019-20.
- The return on Net worth is 18.21% during 2019-20 as compared to 21.37% in the previous year.
- Earnings per share is ₹ 7.36 in 2019-20 as compared to ₹ 7.91 in 2018-19.
- Book value per share is ₹ 40.44 in 2019-20 as compared to ₹ 37.01 in 2018-19.

(D) Development in Human Resources

Competency Enhancement of employees is an important aspect of the Company's Human Resource Strategy. The programs planned by Human Resource Development for the employees are aimed at improving their skills for present and future roles i.e., training for the present roles and development for the future. Enhancement of work related skills both at the individual and at the team level through various HRD initiatives ensure overall development and well-being of our employees.

The Executive Competency Enhancement basket includes Management Development Programmes (MDPs), Technology Enhancement Programmes (TEP) and Quality Enhancement Programmes (QEP) conducted for Executives by In House Experts as well as through Faculty from Premier Institutions/ Agencies.

In the year 2017, BEL established an exclusive Training Academy, NALANDA - BEL Academy for Excellence. The programs are conducted across the Technology, Quality and Behavioural and Leadership Domains.

The Academy facilitates enhancement of competencies through Trainings to address the needs of the current role and through Developmental initiatives to address the needs future role for the Executives across all the Units of BEL. Training and Development has broadly been categorized into three types:

- i) Short Term Programs: Training programs in the area of Radar Signal and Data processing, Aerial Delivery and Airborne Surveillance Systems, Advance Signal Processing Techniques for Modern Radar, Seminar on Technologies for Indian Defence Industries, Tracking and Neutralization of Unauthorized Drones, Microwave & RF, Smart Materials, Structures & Systems, Advanced Metal Processing and Evaluation Techniques, Met materials and Applications, Agile Mobile based Embedded SW Development, IT in Defence. Short term courses are also conducted in various functional areas and other related domains of BEL.
- ii) Certification Programs: WEB based and customized certification programs (4 months duration) from DIAT, Pune in technology areas EW, RADAR, VHDL, DSP, Lab VIEW. Six months WEB based certification program on Foreign Trade by Indian Institute of Foreign Trade was also conducted.
- iii) Long Term Programs: Two customized WEB based M. Tech programs, one from IIT-Madras on Communication & Signal Processing and other from BITS-Pilani on Artificial Intelligence.

The Academy also facilitates Six Sigma projects and in the year 2019-20, 462 Six Sigma projects were completed with estimated savings of ₹ 142 Crores. On the Quality and Project Management front, Global certification such as CRE, CMQ/OE, CQE, CMQ/OE, CSQE in collaboration with American Society of Quality (ASQ) & PMP in collaboration with Project Management Institute (PMI), USA are organized in the Academy.

In the Leadership domain, various programs have been organized to address the Behavioural Competency Enhancement such as, Structured Development Programs, Change Management Program, Advanced Program for Senior Executives, Women Leadership Workshops, Outbound Training Program, Risk Management, HR Analytics Programs, High Impact Train the Trainer and Finance for Non Finance etc.

New initiatives by the Company include Online Development Centres for Executives to ensure focused developmental learning.

Some of initiatives rolled out to enhance Leadership Capabilities of General Managers during the year are enumerated below:

- Introduction of Orientation programs for Newly promoted GMs.
- Executive Coaching.
- Training for Board Interviews.
- Training on Value Creating Financial Strategies.
- Awareness programs on RTI, POSH & Disciplinary Procedures.
- Advance Management Program which included an Overseas Module for gaining International Business Perspective.

Skill development programs for Non-Executives were organized by Unit HRDs in the areas of Technology, Functional Domain, General Management, Professional Development Programs and Other Programs such as Quality, Safety, First aid, Official Language and business specific topics.

BEL has been promoting health and well-being programs for all employees. Workplace health and well-being programs not only have a positive impact on employee wellness, they also lead to a significant increase in the productivity, overall engagement and cohesiveness of the workforce.