IMPORT SUBSTITUTION
(WITH SPL. REF. TO DEFENCE)
THE CONCEPT OF IMPORT SUBSTITUTION:

The term "Import substitution" is widely used in the literature on economic development and international trade, it is not a very clear-cut analytical concept.

In general, the process of import substitution refers to the replacement of imports by domestic production. The demand for a commodity can be met either by imports or by domestic production. These are the two alternative sources of supply for satisfying domestic demand. The particular process by which domestic production to satisfy domestic demand replaces imports is known as import substitution. In the words of Panchamukhi, "Import substitution, we mean a shift in the source of supply from import to domestic production." 1

However it may be noted that import-substitution does not necessarily mean reduction in the total import bill or elimination of imports altogether. Import substitution involves a more positive act of developing domestic production in the place of the replaced imports. In fact, in the initial stages, owing to the need of import capital equipment, technical know-how and raw materials, import substitution may itself lead to a rise in the total import bill. Import substitution is essentially a particular method of allocating the scarce resources of the country to maximise the rate of economic growth and it forms a part of the overall economic policy of the country.

The absolute concept may be valid in a static and unchanging economy. When population and incomes remain constant and demand pattern remain unchanged, an increase in domestic production will automatically lead to a decrease in imports. But in a dynamic economy, it is the relative concept which is more relevant. In the relative sense, "import substitution is considered to exist in the case of given commodity whenever its domestic production increases to at faster rate then its importation, so that imports of that commodity constitute a decreasing proportion of the total supply (domestic production plus imports)."\(^2\).

**TYPES OF IMPORT SUBSTITUTION:**

Import substitution of a commodity, in the usual sense of the term implies, the replacement of imports of the commodity by the domestic production of the same commodity. Thus, for example, the imports of copper may be replaced by the domestic production of copper. Such a substitution of product for product is termed as "direct substitution".

Import substitution may also refer to the replacement of imports of a commodity by the domestic production of substitutes for the commodity. Thus, for example, in the case of copper again, imports of copper may be replaced not only by the domestic production of copper, but also by the domestic. Production of substitutes for copper like aluminium and plastics. Similarly, pyrites may be substituted for sulphur.

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Synthetic fibers may be used in the place of cotton or wool and synthetic rubber can be used in the place of natural rubber, and plastics in the place of metals. Such a type of import substitution is termed as 'technological' or 'functional' import substitution, involving the adoption of alternative techniques of production. It refers to the 'substitution of one product by another of different identity but performing the same function'⁴. Import substitution, in this context, assumes not only an economic aspect but a technical one as well.

The success of functional import substitution depends, to a large extent, on technological factors requiring significant progress in research and development aspects and in the application of new technology. It also calls for changes in the specifications of the end products in order to find suitable alternatives. This represents the most dynamic aspect of import substitution, involving substitution, not in terms of product but by entirely different products. Functional import substitution plays a very important role in the developing economies in view of the structural rigidities, the lagging primary sector and the advancing industrial sector. It also contributes greatly to the technological advancement of these economies.

ADVANTAGES OF THE POLICY OF IMPORT-SUBSTITUTION:

A number of economists advocated industrialization based on import substitution, also known as the 'import-substitution-Industrialization' or the ISI strategy, for the developing countries because of the various benefits associated with the pursuit of the policy. Under this policy industries are established to produce goods that were previously imported. These industries mainly cater to the domestic market and they are protected against foreign competition through tariffs, quotas and other restrictions. Hence the policy also came to be known as an 'inward looking' strategy as against an 'outward looking' strategy.4

Nurkse pointed out that during the nineteenth century trade acted as an 'engine of growth' because of a vigorous increase in the demand for primary products. However, he pointed that during the twentieth century, trade could not play the role of engine of growth because of the relative lag in the industrial countries' demand for primary products, under the altered conditions, Nurkse advocated industrialization catering to the domestic markets maintaining that "When developing countries face difficulties in exporting both traditional and new exports, import substitution strategy may be adopted by them as an escape route from economic stagnation".5


Import substitution policy is sometimes considered to be essential for successful export promotion and export diversification programmes as well.

Indigenous research and development capabilities could also be encouraged through the policy of import substitution to over the adverse consequences of 'technological imperialism' from industrialised areas.

Thus, the policy of import substitution was expected to solve many of the problems faced by the developing countries. It would act as the 'leading Sector' and promote economic growth it would transform their economies and enable them to reach the levels of development of the advanced countries.

It is found that from earlier time some important sectors of industries always shows their positive effects and correlation i.e.:

(i) Vegetable oils and man-made fibres by virtue of the technology involved tend to go from the raw material to the finished product stage in one jump. Stagewise import substitution with a corresponding build up of capital stock is not possible for technical reasons. Hence there is no significant correlation between the capital output ratio and import content.

(ii) In the aircraft industry most of the import substitution has taken place after 1972. until that time most of the import substitution activity for aircraft took place in other sectors.
(iii) The behaviour of the electronic industry is interesting in the sense that the correlation between the capital output ratio and the import content is not only positive but significantly so. The most likely reason for this, is that, the value added in the electronics industry depends more on engineering knowhow and labour rather than equipment.

(iv) Other electricals and transport equipment industries are heterogeneous in their grouping and therefore it is difficult to comment on them.

In the foregoing analysis technological change has not been explicitly dealt with. The reason is that it is hard to distinguish between technological improvement specific to output from technological changes involved in import substitution. To the extent a capital stock build up includes technological change for import substitution it is implicitly covered by the analysis. Technological change specific to output alone, however, is not separately accounted for, but is merged with other causes affecting the capital output ratio.

RATIONAL OF IMPORT SUBSTITUTION POLICY IN INDIA:

Hirschman's identified four motive forces behind ISI, viz, wars balance of payments difficulties, gradual growth in income and deliberate development policy historically, wars and depressions with their consequent sudden disruption

of imports contributed to the establishment of industries in several of the underdeveloped countries. The two world wars and the great depression of the 1930's have played a crucial role in bringing industrialization to the non-industrial countries, with the help of protection given through customs duties, industrialization has also taken place in response to a gradual growth of incomes and markets in these countries and is described as 'import-swallowing', by Hirschman. Industrialization has also been undertaken in many of these countries as a matter of deliberate development policy, industrialization being identified with economic development.

Clark made a distinction between inevitable import substitution as a natural concomitant of growth and planned import substitution as a means of accelerating growth.

As a result, since the middle of the second plan period import substitution policy became an important technique to overcome balance of payments problems. Thus import substitution policy in India was originally directed towards promoting rapid industrialization and later on came to be used as an instrument to overcome balance of payments problems.

From the third plan onwards, achievement of self sufficiency, and self reliance gained prominence as important objectives of the Import substitution policy. Thus

the three objectives, viz., rapid industrialization, overcoming balance of payments problems and achieving self-sufficiency and self-reliance seem to have been combined in the strategy of ISI in the Indian economy each becoming more prominent than the other, depending on the circumstances prevailing in the economy.

During the severe foreign exchange crisis faced by the Indian economy, several economists commented on the stagnation of Indian export. They observed that Indian export earnings would not grow fast enough to meet the growing demand for imports. Foreign exchange shortage would therefore become an important constraint to economic development.

PROGRESS OF IMPORT SUBSTITUTION IN THE INDIAN MNFG. SECTOR:

With the emphasis placed on industrialization since the second plan, the organised industrial sector grew very rapidly as indicated by the index number of industrial production. The general index of industrial production showed a rapid increase from a mere 30.4 in 1951 (with base 1970) to 147.8 in 1978, at a compound growth rate of nearly 6 percent per annum; general index also shows increase from a mere 215.8 in 1993 October to 238.1 in 1994 October (Quick estimates) (with base 1980) at a compound growth rate of

WITH HIGH TARIFF LEVELS, THE SHARE OF CAPITAL GOODS IN TOTAL INDIAN IMPORTS IS FALLING

<table>
<thead>
<tr>
<th>Country</th>
<th>Average Tariff Rates on Capital Goods Imports</th>
<th>Import of Capital Goods</th>
<th>Total Imports</th>
<th>Share of Capital Goods Imports in Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hungary</td>
<td>15.0</td>
<td>6,488</td>
<td>20,096</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>23.5</td>
<td>6,566</td>
<td>22,244</td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td>24.5</td>
<td>6,965</td>
<td>28,235</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>24.8</td>
<td>8,831</td>
<td>35,416</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>54.9</td>
<td>10,466</td>
<td>43,193</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>60.1</td>
<td>6,639</td>
<td>47,797</td>
<td></td>
</tr>
</tbody>
</table>

IMPORTS AND DOMESTIC PRODUCTION ARE POSITIVELY CORRELATED, AND A REVIVAL OF SORTS IS IN SIGHT

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate of Growth</th>
<th>Indigenous Production of Capital Goods</th>
<th>Imports of Capital Goods</th>
<th>(Figures in Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986-87</td>
<td>18.2</td>
<td>51</td>
<td>22.4</td>
<td>17.4</td>
</tr>
<tr>
<td>1991-92</td>
<td>15.9</td>
<td>1</td>
<td>7.0</td>
<td>18</td>
</tr>
</tbody>
</table>

DOMESTIC CAPITAL GOODS INDUSTRY

<table>
<thead>
<tr>
<th>Industry</th>
<th>Rate of Growth (1991-92)</th>
<th>Rate of Growth (April-June 1992)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Transformers</td>
<td>-36.4</td>
<td>13.3</td>
</tr>
<tr>
<td>Railway Wagons</td>
<td>-12.9</td>
<td>26.0</td>
</tr>
<tr>
<td>Ball and Roller Bearings</td>
<td>-12.8</td>
<td>19.1</td>
</tr>
<tr>
<td>Earth Moving Equipment</td>
<td>-13.8</td>
<td>11.8</td>
</tr>
<tr>
<td>Machine Tools</td>
<td>-9</td>
<td>16.3</td>
</tr>
<tr>
<td>Cement Machinery</td>
<td>-37</td>
<td></td>
</tr>
</tbody>
</table>

Source: BUSINESS TODAY, DECEMBER 22, 1992, p 36
nearly 10 percent in October 1993-94 and 8 percent during April-October 1993-94. (With 1980-81 based).

In this rapid growth of the manufacturing sector, import substitution played an important role. The empirical estimates for the Indian economy, for the period 1951-74, indicates that during the first plan period, import substitution was more important in consumer goods industries. With the emphasis on rapid industrialization, import substitution in the investment and intermediate groups become prominent after the second plan period. Covering the three plan periods (1950-51 to 1965-66) the pattern of import substitution was similar.

**TABLE-6.1 : INDEX NUMBERS OF INDUSTRIAL PRODUCTION IN INDIA (1970=100)**

<table>
<thead>
<tr>
<th>Year</th>
<th>General index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951</td>
<td>30.4</td>
</tr>
<tr>
<td>1955</td>
<td>38.5</td>
</tr>
<tr>
<td>1960</td>
<td>54.3</td>
</tr>
<tr>
<td>1965</td>
<td>83.5</td>
</tr>
<tr>
<td>1970</td>
<td>100.0</td>
</tr>
<tr>
<td>1971</td>
<td>104.2</td>
</tr>
<tr>
<td>1972</td>
<td>110.2</td>
</tr>
<tr>
<td>1973</td>
<td>112.0</td>
</tr>
<tr>
<td>1974</td>
<td>114.3</td>
</tr>
<tr>
<td>1975</td>
<td>119.7</td>
</tr>
<tr>
<td>1976</td>
<td>131.4</td>
</tr>
<tr>
<td>1977</td>
<td>138.4</td>
</tr>
<tr>
<td>1978</td>
<td>147.8</td>
</tr>
</tbody>
</table>

*Source: Indian Institute of public opinion, monthly commentary on Indian Economic condition, Delhi Annual, 1979.*

**Year** | **General Index (1980-81 = 100)**
---|---
1993 OCT. | 215.8
1994 OCT. (Quick estimates) | 238.1

*Source: Financial Express Bombay (UNI) 13 Sept. 94 P.10.*
During the period 1950-51 to 1977-78, the highest growth rate was registered in the supplies of sugar mill machinery which increased from Rs. 18 million to Rs. 513.3 million, at the rate of 11.5 percent per annum, while the import availability ratio for sugar mill machinery declined significantly from 100 to negligible amount, indicating significant progress in import substitution in respect of sugar mill machinery, and import availability ratios for caustic soda, Soda Ash and aluminium, declined respectively indicating significant progress of import substitution in respect of these commodities. Progress of import substitution has also been significant in the case of ammonium sulphate, textile machinery and paper and paper boards, etc., whose import-availability ratios showed a decline.

However, the Indian economy is still heavily dependents on import of news prints, as the domestic supply position of newsprint could not be improved significantly to replace the imports, considering India's limited cellulosic raw materials and the cost at which they could be exploited.

On the basis of industrial production index (Base 1980-81 = 100), the partial share of manufacturing industries was 77.10%, mining 11.464, electrical industries 11.429 and in general industrial production was 100 in Oct. 1993-94.
Industrial Production Indices
(Base 1980-81=100)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>215.8</td>
<td>238.1</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>206.1</td>
<td>225</td>
</tr>
<tr>
<td>Mining</td>
<td>212.1</td>
<td>245.8</td>
</tr>
<tr>
<td>Electricity</td>
<td></td>
<td>284.8</td>
</tr>
</tbody>
</table>
**TABLE 6.2 : COMPARATIVE GROWTH RATES IN SELECTED INDUSTRIES**

Based on data available for the first seven months, there has been a general buoyancy in industrial growth in the current fiscal compared to last year (1994-95).

<table>
<thead>
<tr>
<th>Industry/Item</th>
<th>Per cent change (Apr-Oct)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1994</td>
</tr>
<tr>
<td>1. Coal</td>
<td>2.1</td>
</tr>
<tr>
<td>2. Crude Petroleum</td>
<td>17.6</td>
</tr>
<tr>
<td>3. Cement</td>
<td>7.4</td>
</tr>
<tr>
<td>4. Saleable Steel</td>
<td>9.3</td>
</tr>
<tr>
<td>5. Electricity Generation</td>
<td>7.7</td>
</tr>
<tr>
<td>6. Petroleum Refinery Products</td>
<td>4.9</td>
</tr>
<tr>
<td>7. Steel Ingots</td>
<td>6.9</td>
</tr>
<tr>
<td>8. Nitrogenous Fertiliser</td>
<td>4.3</td>
</tr>
<tr>
<td>9. Phosphatic Fertiliser</td>
<td>53.1</td>
</tr>
<tr>
<td>10. Saleable Pig Iron</td>
<td>13.2</td>
</tr>
<tr>
<td>11. Aluminium</td>
<td>3.0</td>
</tr>
<tr>
<td>12. Copper Cathodes</td>
<td>2.5</td>
</tr>
<tr>
<td>13. Sugar</td>
<td>6.8</td>
</tr>
<tr>
<td>14. Salt</td>
<td>-13.1</td>
</tr>
<tr>
<td>15. Cloth-Mill Sector</td>
<td>1.5</td>
</tr>
<tr>
<td>16. Cloth-Decentralised Sector</td>
<td>16.9</td>
</tr>
<tr>
<td>17. Cotton Yarn</td>
<td>2.5</td>
</tr>
<tr>
<td>18. Jute Manufactures</td>
<td>-12.8</td>
</tr>
<tr>
<td>19. Commercial Vehicles</td>
<td>64.7</td>
</tr>
<tr>
<td>20. Cars</td>
<td>18.7</td>
</tr>
<tr>
<td>21. Jeeps</td>
<td>-10.3</td>
</tr>
<tr>
<td>22. Motor Cycles</td>
<td>40.7</td>
</tr>
<tr>
<td>23. Autorickshaws</td>
<td>51.5</td>
</tr>
<tr>
<td>24. Scooters/Mopeds</td>
<td>20.0</td>
</tr>
<tr>
<td><strong>OVERALL</strong></td>
<td><strong>9.0</strong></td>
</tr>
</tbody>
</table>

**Source : Office of Economic Adviser, Ministry of Industry.**

**INDUSTRIAL GROWTH RATE MOVES UP :**

The index of industrial growth during the five-month period April to August 1995 was up by 11.6 per cent compared to the corresponding period last year, mainly due to a buoyant performance in the manufacturing sector. The average index during April-August 1995 was 259.8, compared to 232.9 in the corresponding period last year, shown in Table-6.2.
The manufacturing sector (which has a weight of 77 per cent in IIP) recorded a growth rate of 11.2 per cent, up from the previous four-month (April to July 1995) figure of 10.8 per cent. These growth rates are based on estimates of the index of industrial production (IIP), released by the Central Statistical Organisation.

The growth rate in the capital goods segment which dipped sharply in July 1995, swung upwards registering growth of 12.8 per cent in August 1995.

The overall growth rate in the capital goods segment for the five-month period was therefore 12.7 per cent, up from the previous four-month figure of 12 per cent. The performance of the capital goods segment is important as it is linked to future capacity creation.

The growth rate of the mining sector for this five-month period was 13.8 per cent, down from the four-month performance of 14.8 per cent. Mining has a weight of 11.4 per cent in the IIP.

The growth rate in the electricity sector also dipped to 11.8 per cent during this five-month period, compared to 12.5 per cent during the previous four months. The electricity sector has a weight of 11.4 per cent in the IIP.

Consumer goods, consumer durables and consumer non-durables continued to register high growth rates during this five-month period, compared to their growth rates in the previous fiscal. These categories showed growth rates of 13.4 per cent, 23.7 per cent and 10.8 per cent respectively.
In comparison, although the capital goods segment has maintained a positive growth rate during this five-month period, this has been much lower than the growth rates (29 per cent) registered during the previous corresponding period.

Basic and intermediate goods showed growth rates of nearly 13 per cent and five per cent respectively, during the period under consideration.

Manufacturing, mining, Electrical and General industries annual percentage increase in Oct. 1993-94 was 9.2%, 15.6%, 11.8% and 10.0% while in April-October (average) 1993-94 it was 8.3%, 6.2%, 7.7% and 3.0% respectively (in manufacturing, mining, electrical and in General industrial production).

From the above discussion it is clear that import substitution played an important role in the rapid growth of several of the manufacturing activities. Comparing the substitution to that of export growth, it is found that import substitution larger contributor to industrial growth notably in Japan, Mexico, India and Greece.

The import content in the post-devaluation period is significantly lower than that in the pre-devaluation period period at a 95 percent level of significance. The number of sectors where post-devaluation import content is 99 percent significantly lower that the pre-devaluation import content is 29 (54.72 percent). It has been shown earlier that the import content is significantly correlated with both the
Sugar Production: All-India.
capital-output ratio and the capital-value added ratio in the negative sense. Hence it is to be expected that there should be a substantial rise in both the capital-output ratio and the capital-value added ratio in the post-devaluation period as compared to the pre-devaluation period.

SUGAR RECORDS HIGHEST IIP GROWTH RATE:

Sugar, cars and jeeps registered high growth rates of more than 20 per cent as measured by the index of industrial production (IIP) during the first ten months of the current fiscal year (1995).

Sugar production during 1994-95 reached a record level of 145.85 lakh tonnes surpassing the previous record of 134.11 lakh tonnes in 1991-92.

The production of sugar during the current 1995-96 season, up to December 7, 1995, was 18.18 lakh tonnes as against 21.62 lakh tonnes on the corresponding date last year, according to official sources in the food ministry.

Sugar recorded the smartest recovery in output, recording a growth rate of 147 per cent as per the IIP, although this was over a low base. Likewise, the growth rate of jeeps was an impressive 61 per cent, although once again this was over a low base.

Cars posted a growth rate of 23.8 per cent during the ten-month period, April to October 1995, showing a consistent performance, when compared to the previous corresponding
period. During April to October 1994, this industry segment registered a growth rate of 18.7 per cent.

The growth rate in motorcycles production, however, showed a declaration during the first ten months of the current fiscal at 28 per cent, down from the previous ten-month performance of nearly 41 per cent.

Releasing these figures today as part of an advance forecast of the out-put of 24 select industries, the ministry of industry said that these recorded a growth rate of 10.7 per cent, compared to 9 per cent in the previous corresponding period. These industries account for a weight of 50.37 per cent in IIP.

The six infrastructure industries—coal, crude, crude petroleum, cement, saleable steel, electricity and petroleum refinery products, which have a weight of 28.7 per cent in the IIP—registered a growth rate of 9.7 per cent, compared to 7.7 per cent in the previous corresponding period. Of these, crude petroleum registered the highest growth rate of 13.6 per cent, although there was a declaration compared to last year's performance of 17.6 per cent.

**BICYCLE EXPORTS REGISTER GROWTH:**

The export of bicycles and components from India have gone up to Rs. 600 crores in 1994-95 from Rs. 55.04 crores in 1981-82. The figure is expected to touch Rs. 810 crores in 1995-96.
MULTINATIONALS, IMPORT SUBSTITUTION AND THE TRANSFER OF TECHNOLOGY:

In the early stages of economic development wholly finished products are usually imported from manufactures of international repute. The nature and source of the products depend on the needs, priorities and circumstances of the importing country.

Foreign exchange being bountiful for the former, the pressure for import substitution is generally absent. Where, however, capital formation is the prime objective of a country, the question of transfer of technology in which import substitution has a major role assumes special importance.

In India, particularly, the stance has been that, foreign goods produced on Indian soil should either pay its way by being exported or more typically be subjected to rapid import substitution. From here on much depends on how rapidly the local party frees itself from the import of foreign components. Wherever progress in import substitution is slow for one reason or another the foreign party stands to benefit, for the prime interest of the foreigner is not necessarily confined to royalty or a one-time change. Wherever the components that go into the final product are proprietary in nature or intricate in design the foreign manufactures is in a position to change a monopoly price. Typical examples exist in the engineering industry where the tooling is proprietary to the original manufactures and often
leaves no choice for the local manufacturer but to modify the original product design or develop his own tooling a costly exercise. This has its positive aspect, since it pushes the local manufacturer to develop alternate indigenous sources of supply. On the negative side, however, the product may not come up to international standards for quite some time. This tug of war between the foreign and the local manufacturer is broadly dependent on:

(i) A large enough domestic market to support the local manufacturer even in the event of high local prices;
(ii) The depth of infrastructure facilities locally available;
(iii) Pressure from the government for rapid import substitution or export promotion—a major factor being the scarcity of foreign exchange; and
(iv) The degree of protection by the government against foreign competition. (Competition within the domestic market often plays a positive role.

However, sometimes governments are reluctant to let even competing domestic firms purchase similar technology from different firms abroad on the grounds that the cost of know-how will multiply. Here the trade-off between the benefit of competition on the one hand and the multiple cost of know-how on the other must be carefully worked out.

In most cases the multinationals are in a position to monitor the level of import substitution depending on what facilities they want to phase out in their other locations
and sometimes depending on what obsolete facilities they want to keep alive. Thus it is not uncommon to find that in the automobile as well as a number of other industries import substitution has proceeded rather slowly beyond the assembly stage. How much technological depth some where in abroad and in India have acquired is a most question—one test being the ability to modify products through local R&D efforts. Multinationals usually jealously guard against even minor alterations in their product specifications. Yet let there be no doubt that multinationals have helped tremendously in raising the per capita incomes of same place.

In a sense then it would seem that just as the classical firm functions under shades of competition often ending in oligopolistic situation, the extended model of the firm with import substitution as an added dimension has its own oligopolistic counter part in the nature of the relationship between the multinational and its local partner. 9

On the policy front, the attitude of government to multinationals, considerations of national pride a side, will depend on how serious are their foreign exchange shortage, to what extent they want to over come these shortages through import substitution or export promotion, the essentiality of

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9. On a grander scale some believe that the world market in automobile ancillaries is dominated by Bosch of Germany and Lucas of Britain. Bosch and Lucas operate in India with local partners. The former dominates the fuel injection industry and latter the market for auto-electricals. Despite the range of auto ancillaries, they have so far steadfastly avoided competition with each other in the field of electricals and fuel injections in India—a successful example of market segmentation.
the product in question, the phase of development through which the country is passing and their general approach to modernization and growth. The attitude of multinationals to countries on the other hand will be influenced by the nature of technology they represent, the access to cheap input sources these countries provide and their compulsion for gaining a larger share of the world market.

PRODUCTION AND IMPORT SUBSTITUTION IN DRUG INDUSTRIES:

To meet the needs of foreign exchange and to encourage indigenous production the government imposed heavy restrictions on imports of foreign goods including drugs and raw materials. But as many of them were not produced in the country, it created scarcity on a considerable scale. In view of the pressing demands for all sides the policy was revised from time to time and licences granted to import certain drugs. The restriction, however, continued on import of non essential patent and proprietary medicines for which suitable substitutes manufactured indigenously were available.

PUBLIC SECTOR DRUG COMPANIES

The Indian drugs and pharmaceuticals Ltd., is a public sector drug manufacturing company with an annual turnover of Rs.120.5 crores for the year 1985-86. It has five production plants located at Madras, Gurgaon, Rishikesh, Muzaffarpur and Hyderabad.
It has healthy business environment with a preparation of formulation and company produces other medicines including life-savings drugs such as ampicillin, Tetracycline, Analgesics, Endopa, and Sulphas which together constituted 33% of the total production of the company during 1985-86. There appears shortage of raw materials and funds, impending the production so that the targets set are not being met.

The Hindustan Antibiotics Ltd. (HAL) is another public sector drug manufacturing company. It had an annual sales turnover of Rs. 47 crores during 1985-86. The company mainly produces antibiotics products in bulk.

It has introduced Hamycine and Aurofungin (antibiotic group) through its own R&D efforts.

Institutional sales are made directly from the company to the institutes such as hospitals, government dispensaries and nursing homes and defence establishments where as its open market sales are made through middle man. The company situated in Uttar Pradesh, (The Uttar Pradesh drugs and pharmaceutical Co. Ltd.-Lucknow.) is another public sector drug Co. It is a subsidiary of Indian drug and pharmaceuticals Ltd. It has an annual sales turnover of Rs. 7.66 crores and 12.05 crores during 1983-84 and 1985-86 respectively. The company has a wide range of product groups and 69 percent of the total sales turnover consist of Antibiotics, Analgesics, Sulphas and Anti-T.B. Drugs.
TABLE-6.3 : DRUG PRODUCTION AND EXPORT

PRODUCTION TRENDS :

<table>
<thead>
<tr>
<th>Year</th>
<th>Bulk Drugs</th>
<th>Formulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982-83</td>
<td>325</td>
<td>1600</td>
</tr>
<tr>
<td>1983-84</td>
<td>355</td>
<td>1760</td>
</tr>
<tr>
<td>1984-85</td>
<td>377</td>
<td>1827</td>
</tr>
<tr>
<td>1985-86</td>
<td>416</td>
<td>1945</td>
</tr>
<tr>
<td>2000 AD*</td>
<td>5000</td>
<td>16,000</td>
</tr>
</tbody>
</table>

* Estimated
(Source : IDS 1985-86)

The production of pharmaceutical Industries increased from Rs. 325 crores in 1982-83 to Rs.416 crore in 1985-86 and was expected to elevate upto Rs. 5000 crores in 2000 AD.

TABLE-6.4 : A FIVE YEAR EXPORT TRENDS

<table>
<thead>
<tr>
<th>Year</th>
<th>Bulk Drugs including Quinine Salts</th>
<th>%</th>
<th>Total</th>
<th>Finished formulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981-82</td>
<td>15.45</td>
<td>(18)</td>
<td>84.79</td>
<td>69.34 (82)</td>
</tr>
<tr>
<td>1982-83</td>
<td>11.34</td>
<td>(17)</td>
<td>65.94</td>
<td>54.60 (83)</td>
</tr>
<tr>
<td>1983-84</td>
<td>18.46</td>
<td>(23)</td>
<td>79.92</td>
<td>61.46 (77)</td>
</tr>
<tr>
<td>1984-85</td>
<td>29.25</td>
<td>(23)</td>
<td>128.75</td>
<td>99.50 (77)</td>
</tr>
<tr>
<td>1985-86</td>
<td>-</td>
<td>-</td>
<td>265.00</td>
<td>-</td>
</tr>
</tbody>
</table>

Export activity in the field of pharmaceuticals is of comparatively recent origin. The Industry which began as
an importer of finished proportions and which, before independence, was mainly engaged in processing imported bulk material into formulations switched over rapidly into basic manufacture. Considerable progress has been made in this direction with the result that the industry is today self sufficient to the extent of nearly 30 percent of its raw material requirements.

The number of bulk drugs and pharmaceutical chemicals manufactured in the country by the Indian sector today has risen to more than 6000. These are produced by a total of 300 companies. During the last two years 58 new items have been added to this list. Scores of new companies have come in the field of bulk drug manufacture during past few years.

Exports of pharmaceuticals consists of basic drugs intermediate and fine chemicals (including quinine salts exported exclusively by the Government) and finished formulations.

The Industry has been able to build up an export market for Indian pharmaceuticals in the face of fierce competition from manufacturers in foreign countries with a long record of technological growth than ours. The Industry now has the range of products and facilities to be able to cater to a growing share of the international market but it has not been able to realise this export potentiality. The volume of export is modest so far as compared to total production in the country.
<table>
<thead>
<tr>
<th>Product</th>
<th>Activity</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamycin</td>
<td>Antibiotic</td>
<td>HAI (Marketed)</td>
</tr>
<tr>
<td>Amoscanate</td>
<td>Anthelmintic</td>
<td>Ciba-Geigy (Awaiting Registration)</td>
</tr>
<tr>
<td>HT-725</td>
<td>Anti-Hypertensive</td>
<td>Hoechst (Clinical studies)</td>
</tr>
<tr>
<td>Tinazoline (Varsyl)</td>
<td>Vasoconstrictor</td>
<td>Ciba-Geigy (Awaiting Registration)</td>
</tr>
<tr>
<td>Nitroxazepine</td>
<td>Anti-Depressant</td>
<td>Ciba-Geigy (Marketed)</td>
</tr>
<tr>
<td>GO 10213</td>
<td>Amoebicidal</td>
<td>Ciba-Geigy (Clinical studies)</td>
</tr>
<tr>
<td>Nonaperomaleate</td>
<td>Neuroleptics</td>
<td>Ciba-Geigy (Marketed)</td>
</tr>
<tr>
<td>Forskolin</td>
<td>Cardiac Failure</td>
<td>Hoechst (Clinical studies)</td>
</tr>
<tr>
<td>Contperazine</td>
<td>Anthelmintic</td>
<td>CDRI (Clinical studies)</td>
</tr>
<tr>
<td>Cantchroman</td>
<td>Antifertility</td>
<td>CDRI (Clinical studies)</td>
</tr>
<tr>
<td>Contpyraquin</td>
<td>Anti-Hypertensive</td>
<td>CDRI (Clinical studies)</td>
</tr>
<tr>
<td>Centpropezine</td>
<td>Antidepressant</td>
<td>CDRI (Clinical studies)</td>
</tr>
<tr>
<td>Centbutindole</td>
<td>Neuroleptic</td>
<td>CDRI (Clinical studies)</td>
</tr>
<tr>
<td>Methaquolone</td>
<td>Hyphotic</td>
<td>RRX, Hyderabad (Marketed)</td>
</tr>
<tr>
<td>Centbucrinine</td>
<td>Local Anaesthetic</td>
<td>CDRI (Clinical studies)</td>
</tr>
<tr>
<td>RLX</td>
<td>Bronchodilator</td>
<td>RRT, Jammu (Clinical studies)</td>
</tr>
</tbody>
</table>

Cont'd...
Cont’d...

<table>
<thead>
<tr>
<th>Product</th>
<th>Activity</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contazolone</td>
<td>Tranquilosedative</td>
<td>CDRI (Clinical studies)</td>
</tr>
<tr>
<td>Chandonium Iodide</td>
<td>Neuromuscular Blocking Agent</td>
<td>Punjab University (Clinical studies)</td>
</tr>
<tr>
<td>Contpiperalone</td>
<td>Mypoglycaemic</td>
<td>CDRI (Clinical studies)</td>
</tr>
</tbody>
</table>


SOME EXAMPLES OF ACHIEVEMENTS OF ADAPTIVE RESEARCH

Process Technology (Import Substitution):

1. Amitriptyline
2. Amoxycillin
3. Ampicillin
4. Chloroquin
5. Ethambutol
6. Furosemide
7. Ibuprofene
8. Erythromycin
9. Lignocaine
10. Mebandazole
11. Propranolol
12. Salbutamol
13. Trimethoprim
14. Sulphadime thoxine
15. Sulphame thozole
16. Sulphame thoxazole
17. Doxycycline
And formulations of most of the drugs needed for the country.

FUTURE PLANNING FOR SELF RELIANCE IN PHARMACEUTICAL INDUSTRIES

The Indian pharmaceutical Industry would become self-reliant only when it would possess a strong research and development (technological) base with capabilities ranging from (a) Carrying out innovative research for new drugs, (b) Identifying new molecular entities of therapeutic value through synthetic efforts or from natural resources, (c) Developing advanced drug delivery systems, (d) Adapting imported technologies to local conditions, (e) Substituting imported raw material with indigenous ones and (f) Developing processes for known priority drugs and their formulations.

While development work on import substitution and newer advanced drug delivery system continues, it is also important for the Indian pharmaceutical Industries to create a biotechnology cell within their R&D groups to meet the future industrial challenges. Today, the entire range of living or non-living organisms can be manipulated and engineered through biotechnology techniques to produced a wide range of drugs, chemicals, agrochemicals, fuels, foods, etc. Thus, the need for research and development in the pharmaceutical Industry is of utmost importance.
DEFENCE PUBLIC SECTOR UNITS:

There are nine public sector Enterprises under the Department of Defence production and supply, registered under the Indian Companies Act. these are:

1. Hindustan Aeronautics Ltd. (HAL).
2. Bharat Electronics Ltd. (BEL).
3. Bharat Earth Movers Ltd. (BEML).
5. Garden Reach Shipbuilders & Engineers Ltd. (GRSE).
7. Praga Tools Ltd. (PTL).
8. Bharat Dynamic Ltd. (BDL).

**TABLE-6.6: DEFENCE PRODUCTION IN PSU's**

(Rs. in crores)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>HAL</td>
<td>339.91</td>
<td>450.31</td>
<td>534.74</td>
<td>572.43</td>
<td>641.73</td>
<td>885.90</td>
<td>787.19</td>
</tr>
<tr>
<td>2.</td>
<td>BEL</td>
<td>144.50</td>
<td>183.86</td>
<td>185.95</td>
<td>232.75</td>
<td>328.91</td>
<td>411.82</td>
<td>531.52</td>
</tr>
<tr>
<td>3.</td>
<td>BEML</td>
<td>356.88</td>
<td>404.81</td>
<td>429.27</td>
<td>477.42</td>
<td>514.87</td>
<td>541.37</td>
<td>660.34</td>
</tr>
<tr>
<td>4.</td>
<td>MDL</td>
<td>226.77</td>
<td>289.83</td>
<td>384.43</td>
<td>305.35</td>
<td>284.02***</td>
<td>251.55</td>
<td>351.94</td>
</tr>
<tr>
<td>5.</td>
<td>GSI</td>
<td>13.72</td>
<td>16.63</td>
<td>27.34</td>
<td>35.00</td>
<td>32.06</td>
<td>17.86</td>
<td>39.31</td>
</tr>
<tr>
<td>6.</td>
<td>GRSEL</td>
<td>49.36</td>
<td>66.96</td>
<td>74.78</td>
<td>82.35</td>
<td>91.06</td>
<td>79.45</td>
<td>117.84</td>
</tr>
<tr>
<td>7.</td>
<td>PTL</td>
<td>10.74</td>
<td>14.14</td>
<td>18.22**</td>
<td>18.20</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8.</td>
<td>BDL</td>
<td>0.84</td>
<td>1.33</td>
<td>13.72</td>
<td>34.88</td>
<td>36.70</td>
<td>40.16</td>
<td>56.70</td>
</tr>
<tr>
<td>9.</td>
<td>MIDHANI</td>
<td>7.45*</td>
<td>10.98</td>
<td>17.23</td>
<td>23.04</td>
<td>25.94</td>
<td>27.75</td>
<td>37.59</td>
</tr>
</tbody>
</table>

| Total | 1144.15 | 1418.85 | 1685.58 | 1781.46 | 1953.29 | 2055.86 | 2522.43 | 2838.32 |

---

* Partly under commercial production
** Figure includes excise duty of Rs. 1.32 crores
*** Sales of stores and spares are now being excluded from the value of production.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HAL</td>
<td>247.30</td>
<td>321.11</td>
<td>467.92</td>
<td>623.44</td>
<td>615.53</td>
<td>679.77</td>
<td>689.17</td>
<td>747.00</td>
</tr>
<tr>
<td>2</td>
<td>BEL</td>
<td>142.28</td>
<td>154.93</td>
<td>186.55</td>
<td>225.55</td>
<td>295.62</td>
<td>378.21</td>
<td>498.26</td>
<td>640.04</td>
</tr>
<tr>
<td>3</td>
<td>BEIL</td>
<td>335.10</td>
<td>382.83</td>
<td>426.39</td>
<td>473.16</td>
<td>506.15</td>
<td>509.82</td>
<td>621.68</td>
<td>689.36</td>
</tr>
<tr>
<td>4</td>
<td>NDL</td>
<td>119.19</td>
<td>231.50</td>
<td>142.72</td>
<td>263.00</td>
<td>263.63</td>
<td>344.17</td>
<td>219.80</td>
<td>271.41</td>
</tr>
<tr>
<td>5</td>
<td>GSL</td>
<td>14.33</td>
<td>14.64</td>
<td>18.76</td>
<td>32.16</td>
<td>36.12</td>
<td>4.44</td>
<td>23.03</td>
<td>48.36</td>
</tr>
<tr>
<td>6</td>
<td>GRSEL</td>
<td>51.94</td>
<td>59.94</td>
<td>71.13</td>
<td>98.24</td>
<td>66.51</td>
<td>81.85</td>
<td>74.27</td>
<td>83.44</td>
</tr>
<tr>
<td>7</td>
<td>PTL</td>
<td>11.05</td>
<td>14.87</td>
<td>17.07</td>
<td>18.87</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>BDL</td>
<td>3.55</td>
<td>1.46</td>
<td>6.81</td>
<td>36.51</td>
<td>34.45</td>
<td>42.67</td>
<td>52.42</td>
<td>96.54</td>
</tr>
<tr>
<td>9</td>
<td>MIDHANI</td>
<td>5.18</td>
<td>8.85</td>
<td>13.22</td>
<td>20.65</td>
<td>28.55</td>
<td>23.29</td>
<td>37.71</td>
<td>38.05</td>
</tr>
</tbody>
</table>

| Total | 930.52 | 1189.66 | 1350.61 | 1735.52 | 1865.56 | 2070.22 | 2213.34 | 2614.80 |

* Figure includes excise duty of Rs. 1.32 crores.

The value of production of all the undertakings has increased from Rs. 1144.13 crores during 1982-83 to Rs. 1418.85 crores during 1983-84 an increase of 24 percent. The aggregate value of production of the undertakings increased from Rs. 1418.35 crores in 1983-84 to Rs. 1685.58 crores in 1984-85 and was expected to go up to Rs. 1781.40 crores during 1985-86.

The aggregate turnover/sales reflects an increase of 27.9 percent from Rs. 930.52 crores during the preceding year to Rs. 1189.66 crores during 1983-84 and Rs. 1350.61 crores in 1984-85. This was expected to go up to Rs. 1795.52 crores during 1985-86.
During 1987-88, the aggregate value of production in the defence PSU's was Rs. 2055.86 crore against Rs. 1953.29 crore in 1986-87. The aggregate turnover (sales) during 1987-88 also increased to Rs. 2070.22 crore from Rs. 1865.56 crore in 1986-87.

During 1988-89 the aggregate value of production in the defence PSU's was Rs. 2522.43 crore against Rs. 2055.86 crore in 1987-88, it was expected to cross Rs. 2800 crore figure in 1989-90. The aggregate turnover (sales) during 1988-89 increased to Rs. 2213.34 crore from Rs. 2070 crore in 1987-88 and was expected to cross Rs. 2600 crore in 1989-90.

1. HINDUSTAN AERONAUTICS LIMITED (HAL):

Hindustan Aeronautics Ltd. (HAL) was set up in 1964 by amalgamating Hindustan Aircraft Ltd. with Aeronautics Ltd. The principal business of the company is to design, manufacture, repair and overhaul various types of aircraft and helicopters and related aero-engines, avionics, instruments and accessories. The company has 13 divisions located in six states.

HIGHLIGHTS 1982-83:

Laying of the foundation-stone of the Korwa Factory by the prime minister on 26th February, 1983.

1983-84:

The significant features of performance during the year 1983-84, were production for the first time of
Frontline fighters, MiG-29 and Jaguar aircraft
MODEL OF ALH.
Defence equipment: sophistication suspect

The latest aircraft for the Navy, 'The Sea Harrier'.
indigenously designed Kiran MK.II and HPT-32 aircraft, series production of Ardhra Gliders, manufacture of a fighter aircraft, its engine and accessories; successful test run of HAL designed turbojet engine for pilotless target aircraft, design and development of vector cardiogram for monitoring heartbeats of cosmonauts for use in the Indo Soviet space mission and its signing of Licence Agreements for manufacture of Dornier aircraft and Garrett engines.

The significant features of the performance of HAL during 1984-85 were:
- Delivery of the first MIG-27 Aircraft to the Indian Air Force;
- Commencement of the preliminary design phase of the Advanced Light Helicopter;
- Successful design and Construction of a Test Bed for Garrett Engines; and
- Participation in the Paris Air show.

HIGHLIGHTS - 1988:

(i) Contribution was made to the PRITHVI Missile project. The Missile, in incorporating 52 major structural items manufactured at Bangalore Complex, and the actuators developed by Lucknow Division, was successfully launched during February, 1988.
(ii) Productionisation of battle field surveillance Rodar MK.II, designed by Defence Electronic Research Laboratory, was under process at HAL.
(iii) Helicopter Division has successfully assisted the Indian navy in the installation of essential optional equipment for the Antarctica expedition. The division has also successfully integrated certain indigenously manufactured avionics equipment and instruments on Chetak Helicopters for the navy.

(iv) Three Light Alloy structures and one Water Tank for PSLV project were completed ahead of schedule. The water tank which was welded by HAL technicians for the first time was of a high quality and withstood test pressure five times that of the design requirement.

HIGHLIGHTS - 1989-90:

(i) The first HTT-34- Trainer Aircraft was produced and successfully test flown.

(ii) Major servicing of kiran MK-1 and MK-11 Aircraft was carried out at the overhaul Division.

(iii) Against export orders from British Aerospace, UK Aerospatiale, France, fabrication of components commenced at Kanpur and Bangalore.

ITEMS EXPORTED AND VALUE OF EXPORTS:

An export order of 8 Chetak helicopters including spares valued at more than Rs. 9 crores was received in 1982-83 which were delivered in 1983-84, while the company has an export target for Rs.10.84 crores during 1983-84, order worth Rs.11.50 crores as compared to Rs.1.64 crores during 1982-83.
The export earnings during 1984-85 were Rs. 44 lakhs compared to Rs. 11.50 crores during 1983-84. The budget estimates export target for 1985-86 was Rs. 0.77 crore.

HAL PSU's earning during the year 1986-87 and 1987-88 were Rs. 1.25 and Rs. 1.14 crores respectively and also earned Rs. 1.93 crores in 1988-89 and Rs. 3.32 crores (estimated) during the year 1989-90.

INDIGENISATION/IMPORT SUBSTITUTION:

Keeping in view the need for greater self-reliance, HAL is laying stress on indigenous design and development of Aircraft, Avionics and Accessories. The HPT-32 elementary piston engine, and Kiran MK-11 basic jet trainer are in advanced stages of development. Work was in progress on Ajeet trainer and PTAE-7 small jet engine. At the Avionics design Bureau at Hyderabad Division, a number of design and development projects, such as communication and navigation equipment, fire control radar and futuristic IFF for modern front line aircraft were under development. Work on certain aircraft engine systems, accessories and instruments progressed satisfactorily. Development ofgyro and navigation system has been completed.

Indigenisation activities are being actively pursued in order to progressively reduce the import content of HAL designed and developed aircraft. Considerable progress in this regard has been made by the company particularly in regard to raw materials and components for MTG series
aircraft. During the year (1983) under review, 357 items comprising metallic and non-metallic materials, chemicals/consumables, castings and forgings, standard parts and spares for rotables were indigenised by the various HAL Design Bureau Divisions resulting in an anticipated foreign exchange savings of Rs.35.45 lakhs per annum, 126 items of Jaguar Ground Handling Equipment which were fabricated at the undertaking have also resulted in foreign saving of Rs.8.65 lakhs. Upto the end of September, 1983, 358 items have been indigenised out of the 1157 items proposed to be indigenised during 1983-84.

As part of the continuing efforts to achieve self-sufficiency, indigenisation programmes were implemented by all the divisions, as in the previous years during the year 1983-84 1255 items were indigenised by the various HAL design bureau/divisions. The anticipated foreign exchange savings due to this indigenisation efforts were estimated at Rs.66.55 lakhs per annum. During 1984-85, 1441 items were planned for indigenisation, out of which 600 items had been indigenised upto the end of September 1984.

During the year 1985-86, 1112 items are planned to be indigenised by various Divisions/Design Bureau of HAL, out of which 430 items have been indigenised upto September 30, 1985. The anticipated foreign exchange savings due to this effort is of the order of Rs.20 lakhs per annum.

Indigenisation programmes have been implemented by all the divisions of HAL as a part of continuing efforts to
achieve self-reliance during 1987-88, 1453 items were indigenised, including air intake blanks, sophisticated test rigs, ground handling equipment, heavy magnesium alloy castings of radiographic quality for missile projects, stainless steel rolled bares and silicon rubber compounds. The foreign exchange saving on account of these efforts is of the order of Rs. 687 lakh.

During the year 1989-90, the defence PSU's participated in several defence exhibitions abroad with a view to promoting exports. HAL took part in the defence exhibition at Ankara in May 1989. HAL also took part in the Paris Air show in June, 1989, and will be participating in the Farnborough Air show scheduled to take place in 1990, HAL, the defence Shipyards and the ordnance factories exhibited their products at the Asian Aerospace-90 and Asian defence-90 was held at Singapur in February, 1990.

2. BHARAT ELECTRONICS LIMITED (BEL):

Bharat Electronics Limited was established in 1954, with the setting up of a unit at Bangalore. It is presently the country's premier electronics manufacturing organisation having nine operating units located in six states since its inception. BEL has achieved progressive self-reliance in the design, development and production to international standards of radio communication, radar and broadcasting (sound and television) equipment and electronic components.
HIGHLIGHTS:

The highlights during the year include a sales turnover of Rs. 128.44 crores which was 50 percent more than the previous turnover of Rs. 82.35 crores. This was achieved inspite of industrial unrest and a month-long lock out in May, 1981. The company received approval during second half of 1982 for setting up two equipment factories and one factory for the manufacture of Glass Bulbs for black and white TV Picture Tubes.

Highlights during the year 1983 include laying of foundation-stone of TALOJA unit of BEL by defence minister on 19th December, 1983. This unit will be manufacturing one million black and white TV Glass shells per year, in collaboration with m/s Corning Glass works of U.S.A.

Work was in progress at the newly sanctioned units of BEL, at Panchkula (Haryana) and Kotdwar (Garhwal). The units were likely to go into production in 1985-86.

The company has ventured into the area of manufacture of optical/opto electronic equipment through the newly acquired Asco, unit at machilipatnam.

BEL, has signed a memorandum of understanding with Indian Space Research Organisation, Bangalore and DLRL Hyderabad, for development and production of equipment needed for space research and in the field of electro-magnetics.
The company has undertaken supply of electronics voting machines to election commission for use in elections. The company also bagged the prestigious award for import substitution.

The company has undertaken the challenge of supplying High Power Transmitters, Low Power Transmitters and TVRO's etc., for special crash plan for expansion of TV network in the country 1983-84 and 1984-85.

The value of production has increased from Rs.127.29 crores in 1981-82 to Rs.144.50 crores in 1982-83 and was estimated to be of the order of Rs.155.31 crores in the year 1983. The value of sales has increased from Rs.128.44 crores in 1981-82 to Rs.142.28 crores in 1982-83 and was estimated to be of the order of Rs.155 crores during the year 1983-84.

Research and Development work on many important projects have been completed, resulting in sizable.

Production orders. They include SATELLITE RELAY RECEIVER for DOORDARSHAN, 100 KW medium wave Transmitters, Accounting and listing machine for P&T, Ground to Air communication Transmitter, Electronic Voting Machines, Hybride Micro Circuits and LCD's.

Construction of the factory and administrative buildings of the TV Glass shell factory at Taloja in Maharashtra is in full swing and the work is expected to be completed by, mid 1986. The construction of the new factory
at Panchkula in Haryana to manufacture professional grade electronic equipments has also commenced and preliminary work for taking up construction is in hand for the new unit at Kotdwara, Garhwal, in U.P.

With a view to create a "Quality Culture" among its employees and also to encourage active involvement participation in its activities, the company started quality control circle movement about two years ago. At present 142 Quality control circles are functioning in BEL (110 in Bangalore complex and 32 in Ghaziabad unit).

BEL has supported doordarshans special crash plan for expansion of TV network in the country against a tight time schedule. During 1983-84, BEL, supplied eight 10 KW. TV Transmitters and 44 Television Receive only terminals (TVROS). By the end of September 1984, additional nine 10 KW TV Transmitters sixty five 100 KW Low power Transmitters (LPTS) and 84 TVROS's were delivered.

In 1988, the Panchkula and Kotdwara units manufacture equipment wholly developed by BEL, have gone into commercial production.

The company received the Electronic Component Industries Association (ELCINA) Award for outstanding work in indigenous (import substitution) development of capital goods and the standardization, award for achieving better quality and improved efficiency.
EXPORT AND FOREIGN EXCHANGE EARNINGS:

The total foreign exchange earnings during 1981-82 was Rs. 10.78 crores and estimated that equipment and components worth Rs. 12.00 crores will be exported during 1982-83. The company has exported equipment and components of approximately Rs. 9.19 crores upto end of November 1982. HF communication equipment was exported to Iraq during 1981-82 and proposals for establishing and electronics factory in Tanzania are also being processed. The company also plans to exploit in the export market the expertise gained in the field of system engineering in electronics. The exports of the company would have been much higher but for the constrains on capacity and the prior commitment to the defence and other indigenous users.

Besides exporting HF equipment, accessories and spares, the company has also exported various types of components like X-Ray Tubes, Receiving valves, Transistors, Transmitting Tubes, Magnetron Tubes and integrated circuits to countries like Philippines, New Zealand, Italy, Switzerland, Spain, West Germany, Yugoslavia, UK, Zambia, and U.S.A. The value of exports amounted to a little over Rs. 13 crores during 1982-83.

However, due to outstanding domestic orders and capacity constraints, During the year 1983-84 exports amounted to Rs. 5.75 crores and the value as per revised estimates for 1984-85 was Rs. 0.5 crores. The drop in exports is mainly due to the capacity constraints in booking large
orders. The value of exports during the year 1985-86 was a modest Rs. 4 millions. When the new units go into full production, the company will be able to step up exports.

BEL exported during the year 1986-87 and in 1987-88 Rs. 0.37 crores and Rs. 1.00 crores respectively. In the year 1988-89 and 1989-90 BEL earned from exports Rs. 3.84 crores and Rs. 5.11 crores respectively.

**INDIGENISATION IMPORT SUBSTITUTION:**

The company is continuing its policy of increased indigenisation, both in house and through sub-contracts and ancillary industries, in recognition of which it was awarded the ELCINA import substitution prize for 1982.

BEL continues to be in the vanguard of the development of electronic equipments and components for meeting the growing requirement in the country and in overseas markets, and various items and components were developed during the year 1983-84. A number of products have also been added to the manufacturing line through transfer of technology from abroad. During 1983-84 import substitution/indigenisation efforts resulted in savings of about Rs. 0.6 crore.

During the year 1984-85 most of the systems/equipments developed, manufactured and supplied by BEL fall under the category of direct import substitution on an average the indigenous content in BEL's products is as high as 80 percent.
BEL's own R&D efforts supports the company's progressive manufacturing activities by developing new products and improving existing ones, innovating new system and updating the technology.

Several new R&D projects which had been completed during 1987-88. Their production value during the year amounted to Rs. 23.3 Crore which was 5.92% of the total sales. Several new projects are being taken to meet the requirements of the armed forces and civil customers in 1987-88, the indigenous content in BEL's production was 70%. The high percentage of indigenisation has been achieved as a result of R&D activity within the company or under collaboration with DRDO establishments.

In the year 1988-89 apart from taking on futuristic projects, these laboratories also facilitate better and more extensive interaction with other R&D groups in the country so that dependence on foreign technology is minimised. Several R&D projects, which had been completed during 1987-88, went into production during 1988-89. The value of production relating to the company's own R&D during the year amounted to Rs. 33.4 crore which was 6.70% of the total sales. During 1988-89, the indigenous content in BEL's production was 70%. This level of indigenisation has been achieved as a result of R&D activity within the company or under collaboration with DRDO establishments.
3. BHARAT EARTH MOVERS LIMITED (BEML)

M/S Bharat Earth Movers Ltd (BEML) was established by having of the Railcoach Division from M/S Hindustan Aircraft Ltd. in 1964. It commenced production in BEML is an established name amongst the manufacturers of heavy earthmoving equipment used in the core sector of the economy and heavy duty Vehicles/equipment for meeting the requirements of both the civil and defence sector. The company has its corporate office and marketing division located at Bangalore, three production complexes at Kolar Gold Fields (KGF), Bangalore, and Mysore; a Research and development division at KGF with a unit each at Banglor and Mysore; and a well knit country-wide net work of sales and service centres/Regional offices under its marketing division. BEML took over M/S Vignyan industries Ltd., as its subsidiary in 1984.

BEML-HIGHLIGHTS:

In 1981-82 BEML achieved a record turnover (sales) of Rs.222 crores and a pre-tax profit of Rs.29.88 crores.

During 1982-83 BEML:

(i) Achieved a record value of production of Rs. 356.88 crores during 1982-83, which was estimated to go up to Rs. 368.06 crores during 1983-84. Similarly B.E.M.L. achieved a turnover of Rs.335.10 crores during 1982-83 which was estimated to go up to Rs. 361.53 crores during 1983-84. The company made a profit of Rs.42.42 crores during the year 1982-83.
The indigenously designed and developed main battle tank “Arjun” which showed its speed, manoeuvrability and firepower, on Sunday. — PTI.
FRONT END LOADER --- Manufactured by Bharat Earth Movers Ltd.
(ii) Growth in productivity achieved during the preceding year was sustained during the year under review and the value of production per employee increased from Rs. 1.92 lakh in 1981-82 to Rs. 2.76 lakh during 1982-83.

The significant achievements in 1982-84 and likely achievements in 1984-85, are indicated below:

The growth in productivity achieved during the preceding two years was kept up also during 1983-84. The value of production per employee during 1983-84 has gone up to Rs. 2.92 lakhs from Rs. 2.76 lakhs in 1982-83.

During the course of the year, (1983-84) two new products VIZ. Hydraulic excavators and comp Houses, were introduced. The company also started manufacture of the updated version of GD 605R Motor Grader at its Rail coach division.

Customer satisfaction continued to be the principal objective of the company. There was considerable strengthening in the areas of spare parts support. Spare parts sale alone touched Rs. 69 crores in 1983-84 as compared to Rs. 46 crores in the previous year.

The significant achievements in 1984-85 and the expectations for the year 1985-86 indicates the growth in productivity achieved during the preceding two years was kept up also during 1984-85 and the value of production per employee during this year went up from Rs. 2.92 lakhs to
Rs. 2.98 lakhs. Similarly during the year value added per employee also touched an all-time high figure of Rs. 1.25 lakhs.

During the year 1984-85 three new products viz., 1.2 cum Hydraulic Excavators, 66 HP Bulldozers and 60 T Bottom dumpers were introduced. 85 T Dump Trucks of M/S KOMATSU design were also produced.

In 1988 BEML has introduced four new products viz, 300 HP wheeled Dozer, 3.1 MWA leader, Transmissions and final Drives for TCV/BMP. 11 vehicles and Tatra Heavy Duty Trucks for its regular line production.

The significant achievement in 1988-98 and the expectations for the year 1989-90 are:

(i) Five new products viz-120 Ton Electric Dump Truck, Rope Shovel, 165 Horse power Bulldozer, overhead inspection Car, and Track Laying Equipment were introduced.

(ii) The company received the Corporate Excellence Award for its outstanding performance in 1986-87 from amongst the PSU's in engineering sector.

**EXPORTS AND FOREIGN EXCHANGE EARNINGS:**

The company exported Earthmoving equipment and spares worth Rs. 444 lakhs to Bulgaria, Bhutan, Burma etc. during 1981-82 as compared to Rs. 198 lakhs during the preceding year. The exports during 1982-83 were except to be of the order of Rs. 5 crore.
Equipment and spares worth Rs. 563 lakhs were exported to Bulgaria, Bhutan, Burma etc. during the year 1983-84. In addition, a number of new export avenues have been explored which are expected to boost exports during 1983-84 and beyond.

Equipment and spares worth Rs. 14.34 crores, an all time high, were exported during 1983-84 primarily to Bulgaria, Bhutan, Algeria and Indonesia. The company has for the second time in succession won the 7th international Trophy for Export Excellence from Editorial office, Madrid.

Equipment and spare parts of the value of Rs. 10.18 crores were exported during 1984-85, mainly to Bulgaria, Ghana, Bhutan, Algeria, Indonesia, etc. in addition, a number of new export avenues are being explored and it was expected that the exports will show further increase during 1985-86.

BEMI earned Rs. 11.81 crore in 1986-87 and Rs. 43.38 crore in 1987-88; BEMI was awarded the Export Promotion Council award 1987-88. Export amounted to Rs. 39.28 crore in 1988-89 and Rs. 50.00 crore estimated in 1989-90.

INDIGENISATION/IMPORT SUBSTITUTION:

Indigenisation in earth moving equipment was expected to go up further. The indigenous content in the Rail Coaches and Heavy duty Trailers is almost 100 percent. With the productionising of 1.6 Cu. mtr. Loader which has been designed and developed by the company’s R&D, the number of products designed and developed by R&D and which have been
productionised, went up to 11 out of the total number of 30 products being manufactured by the company.

The indigenous content has reached a high level in many of the company's products. During the course of the year, two products, viz, 25 Ton Rear Dump and G14D-Dozers, which were designed and developed by the company's R&D, were productionised, replacing the earlier collaborated models. Manufacture of GD 605 R-1 Motor Grader has also commenced at the Rail Coach Division, replacing the earlier mechanical version (model 440). The prototype testing of 41-Ton Pipe Layer and 60-Ton Bottom Dumper Earth Hauler made significant progress and it is anticipated that production of the items will be 3m of Defence/83-5.

Design and Development of the 50-Ton Tractor for towing the heavy duty trailer, 8-Ton Crawler Loader and 11-Ton wheeled Loader, was also in progress. In the year 1982-83 development was also an updated version of the 35 Ton Dump Truck; During 1972-83, BEML R&D developed the crawler mounted shovel which bagged the coveted "National Award" of "Silver shield for import Substitution".

In the year during 1983-85 and 1984-85, the R&D programme started in the earlier was continued with increased vigour and significant progress was made in reaching higher levels of indigenisation in all products. The company has produced prototypes of three new products, viz 50-Ton Tractor for Towing Heavy Duty Trailer, Aircraft Towing Tractor and 8-Ton progress. Manufacture of prototypes of 6 cum. FEL, 300
HP Articulated wheeled Dozer and updated version of 35 Ton Dump Trucks are in progress. User/Technical in respect of mechanical version of 41-Ton pipelayer, Hydraulic version of pipelayer, prototype of 60-Ton Bottom Dumper (Earth Hauler) and prototype of 130 HP have been completed. Modifications/improvements have been carried out, wherever necessary.

Indigenisation content has reached a high level in many of the company's products and concerted efforts are being made to achieve higher levels of indigenisation during 1984-85.

During 1985-86 R&D programmes started in the earlier years were continued with increased vigour and higher indigenisation was achieved in all products. While the trial on company's prototypes Heavy Duty Tractor, Towing Trailers, and Ton crawler Loader were still (1985-86) in progress, the development of proto-Type for 6 cum front End Loaders, 300 HP Articulated wheeled Dozer and updated version of 35 Ton Dump Trucks were completed and these were given for trials.

As in the previous years, efforts towards the assimilation of foreign technology, indigenisation and developmental work continued in full swing. The indigenisation percentage in the establish equipment is over 85%. The 300 HP wheeled Dozer introduced recently is fully designed and developed by BEML's WON Research and Development Division. The R&D wing of BEML has successfully developed overhead Electronic (OHE) inspection Cars and track laying equipment specifically required by the Railways. These are
presently undergoing proving trials with the users, before commercial production.

In 1983-84, the overhead electric inspection Car and the track laying equipment, designed and developed by the company's own R&D efforts, was productionised to meet the specific requirements of the Indian Railways. The company's sophisticated R&D center has been set up with an investment of around Rs. 20 crore. This center was dedicated to the nation on September 21, 1983.

4. MAZAGON DOCK LIMITED (MDL):

Mazagon Dock Ltd. (MDL) has come a long way from being a ship repair yard in 1960 to its current status as the premier builder of warship, submarines, and offshore platforms. Since 1960 the company had made profits every year till 1983-84. However, from 1984-85 onwards heavy losses have been incurred by the company mainly because of certain unprofitable projects, unproductive investments in its offshore business ventures, and reduced quantum of fresh orders.

HIGHLIGHTS:

During the year 1982-83, the company registered or impressive all round growth in production as well as profit. There has been an increase of 79 percent in the value of production for 1982-83. The value of production which stood at Rs. 126.77 crore during 1981-82 increased to Rs. 226.77 crores during 1982-83. Similarly, the profit before
INS TIR The Indian Navy's first indigenously designed cadets training ship commissioned on 21st February 1986 built by the Mazagon Dock Limited.
tax rose from Rs.5.63 crores during the preceding year to Rs.9.93 Crores during 1982-83.

The company had three Indian designed Godawari Class frigates as well as three Offshore patrol vessels under various stages of construction and they have also received orders for a large cadet training ship as well as two corvettes. The production of offshore fixed platforms and maintenance support services amounted to Rs. 102.76 crores during 1982-83 as compared to Rs. 48.60 crores during the previous year.

The last of the leander frigates "INS INDRYA GIRI" was delivered to the navy on 8-7-1981. After successful completion of the leander programme the company had undertaken construction of the navy's new series of indigenously designed Godavari class frigates which are bigger than the leander class. The construction of frigates of the Godavari class marked a mile-stone towards self reliance in design technology. The company has also undertaken the design and construction of offshore patrol vessels for the Indian Coast Guard. These vessels are ships specially designed for patrolling, policing search and rescue operations in the exclusive economic zone and protection of offshore installations. The new project for construction of corvettes has also been taken in hand by the company and the first vessel is scheduled to commence in May, 1983.

INS Godawari, was commissioned into the Indian Navy on 10th December, 1983. The second frigate, INS Ganga was expected to be commissioned by October, 1985. The third
frigate, INS Gomati, was launched on 19th March 1984 and was expected to be Commissioned in 1987. The first offshore patrol vessel CGS VIKRAM, ordered by cost guard was delivered and commissioned on 19th December, 1983. The vessel was designed by the company to the specific requirements of the cost guard. The performance of CGS VIKRAM is very satisfactory and has come up to the specification, requirement and expectations of the cost guard. The second vessel, CGS Vijay, was launched on 5th June 1982, CGS VEERA was launched on 30th June 1984. An order had been secured from cost guard for three more offshore patrol vessels.

(a) Worships: During the year 1985-86 the company had secured orders for 3 offshore patrol vessels for cost guard at a total price of Rs. 60.75 crores. Order for construction of 2nd cadet training ship at a cost of about Rs. 28-32 crores from the Indian navy had been received during the year 1986. Company was also been chosen as the lead yard for manufacture of 6 Missile Boats.

(b) Merchant ships: The value of the orders at the end of the year was Rs. 175.44 crores. During the year 1986, the company was also secured an order for one 30 Tonne Bollard Pull Voith Tug for Tuticorin port Trust.

MDL commenced the construction of a series of indigenously designed, large and sophisticated Godavari Class Frigates. The last of the Godavari Class Frigates, INS GOMTI, was delivered to the Indian navy in April 1988. In the sphere of shipbuilding, MDL has been progressively
indigenising equipment, in consultation with the navy and the coast guard. In the last of the Godavari class frigates viz. INS GOMTI, indigenous equipment to the extent of over 70% was installed, it is also the lead yard for the construction of fast and powerful corvettes of indigenous design.

During the year 1983-90. The sixth offshore patrol vessel, CGS VIVEK, was commissioned into the coast guard;

- The first corvette, INS KHUKRI, was commissioned into the navy.

- The first ever indigenously built submarine, INS SHALIK, was launched.

ITEMS EXPORTED AND VALUE EXPORTS:

A contract was earned into with the government of Mozambique for supply of 10 Launches, costing Rs. 466 lakhs. export earning during 1982-83 were Rs. 7.81 crore.

During the year 1983-84 value of the orders secured, amounted to Rs. 126.80 crores as against Rs. 52.01 crores in 1982-83. In 1983-84 construction of ten launches for export built at Goa and three in Bhavnagar. The contribution of these shipyards to the turnover of the company for the year 1983-84 was Rs. 0.35 crores. During the year 1985-86, 10 fast Launches for export to Mozambique were completed and delivered to the owners.

INDIGENISATION/IMPORT SUBSTITUTION:

The company has been diversifying in the areas of high technology with a view to saving precious foreign
exchange by direct import substitution and the areas where
the company has contributed substantially to import
substitution include:

(i) Offshore well Head platforms.
(ii) Offshore production platforms.
(iii) Transportation and installation of offshore platforms.
(iv) Construction of OSVS.

The programme for construction of submarines will be
a significant contribution to import substitution in a vital
area. The company contributed Rs. 30.13 crores by way of
direct import substitution and saving foreign exchange.

During the year 1982-83, there has been a steady
increase in the company's contribution in the sphere of
import substitution. The new frigates being built in the
company will carry an increasingly indigenous content of
impressive and sophisticated weapon control system,
electronic equipment and machinery. The items equipment
successfully indigenised cover alternators, special paints,
categories of piping and pipe installations special electric
cables etc, efforts for import substitution were continued in
the following areas during the year under review:

(i) Offshore well platforms.
(ii) Production and process platforms.
(iii) Transportation and installation of offshore platforms.
(iv) Construction of offshore supply vessels.

The programme for construction of submarines and pipe
coating for ONGC will be significant contributions to import
substitution in the year 1983-84. The company contribution
Rs. 60.67 crores by way of direct import substitution and savings in foreign exchange during 1982-83 as compared to Rs. 30.13 crores in the year 1981-82.

Efforts for import substitution were continued in the following areas during the year (1983-84) under review:
(i) Offshore well platforms.
(ii) Production and process platforms.
(iii) Transportation and installation of offshore platforms, regarding of support services like diving-cum-rescue operations, coating and laying of pipes, etc. and
(iv) Construction of specialised vessels like OSV's, MSV's jack-up rigs, etc. for offshore use.

During the year total turnover in the above offshore activities, including the construction of offshore vessels amounted to Rs. 154.21 crores, of which indigenous contribution was Rs. 88.89 crores, by way of direct import substitution and savings in foreign exchange during 1983-84, as against Rs. 60.67 crores in the previous year (1982-83).

Efforts, during the year 1984-85, for import substitution were continued i.e.:
(a) Offshore well platforms.
(b) Production and process platforms.
(c) Transportation and installation of offshore platforms, rendering of support services like diving-cum-rescue operation, coating and laying of pipes etc.
(d) Construction of specialised vessels like OSV's, MSV's, jack-up rigs etc., for offshore use.
During 1988 systematic efforts are continuing towards import substitution and to achieve as much self-reliance as possible in areas of ship building and manufacture of offshore platforms. Major equipments for well-head platform such as test separators, manifold skids, deck crangs, dry chemicals, fire fighting systems etc. have been indigenised. These efforts have resulted in substantial savings in foreign exchange.

5. GARDEN REACH SHIP BUILDERS & ENGINEERS LTD. (GRSEL) :

Garden Reach Shipbuilders and Engineers LTD. (GRSEL) was originally set up in 1884 and was acquired by Government of India in 1960. The company has 6 units in and around Calcutta and a diesel Engine plant located at Ranchi and Nagpur. (Rook Rotier Unit).

HIGHLIGHTS : IMPORTANT HAPPENINGS :

The highlights during the year 1981-82 included the delivery of first bulk carrier, MV LOK PRITI in December 1981 to M/S Mogul Lines LTD., the 37.5 metre Seaward Defence Boat to the coast guard in November, 1983, the 30-Ton Bollard pull Tug to Tuticorin Port Trust in June 1982, the 6th Seaward Defence Research Vessel to the Central Marine Fisheries Research Institute in December 1982.

During 1982-83/83-84, the handing over of the sophisticated ocean going Tug INS MATANGA to the Indian Navy. In addition a seaward defence boat for the Indian navy, one 30T Bollard pull Tug for Tuticorin port and a fishery
INS NIRUPAK — the third of the series of survey ships entered service on 14-8-1985 in the Indian Navy. This ship, capable of modern oceanographic research-cum-survey, is designed indigenously by the Indian Navy, assisted by Garden Reach. NIRUPAK has already rendered yeomen service in the task of hydrographic survey and related oceanographic work.

Lok Prut—25,000 Tonnes Dead Weight Bulk Carrier built by Garden Reach Shipbuilders & Engineers Ltd.
Research vessel for the Central Marine Fisheries Research Institutes, Cochin were also delivered during 1982-83. Orders have also been received for three in-shore patrol vessels for coast guard and two sophisticated worship for the Indian navy. An order has been received for 3 offshore supply cum standby vessels for the ONGC.

In the year 1983-84/84-85 keels were laid for six vessels comprising 2 Defence Boats, 2 inshore patrol vessels and 2 offshore platform support-cum-standby vessels for ONGC, four defence Boats, the third of the series of Bulk carriers (28,000 DWT) for Mogul line and 20 Ton Bollard pull Tug, one Survey vessel for the Indian Navy and the sophisticated Ocean Tug "MATANGA" for the Indian Navy.

The main achievements in the year 1984-85 were as follows:

Keels were laid for one inshore patrol vessel and one Offshore Platform Support-Cum-Standy Vessel (OPSSV) for ONGC, two inshore patrol vessels for the coast guard, one Seaward Defence Boat and one landing ship Tank (Large) for the navy were launched. Two seaward Defence Boats for the Navy, one seaward patrol craft for the coast guard and the 2nd of the series of Bulk carrier for Moghul Lines LTD., were commissioned. A coal handing plant for 500 MW capacity Thermal power plant at Trombay and Turnkey power projects sets for Eastern coalfields Limited (ECL)- Rajmahal, were also commissioned. Eight Bergan Engines for OPSSV's ordered on Indian Shipyard were Supplied in time.
Three Inshore patrol vessels for the coast guards, one Survey vessels for the navy and one seaward Defence Boat for the navy were delivered by November 19, 1985.

One sea patrol craft for the coast guard and two offshore platform support-cum-standby vessels for ONGC were expected to be commissioned during 1985-86. Estimated value of production for the year 1988-89 was about Rs. 116 crore.

During the year 1987-88/88-89, the Company has entered into licence agreement with M/S Moterelund Turbinen Union Friedrichshafen GmbH (M.T.U) of West Germany to enable the indigenous manufacture of MTU diesel engines, which are suitable for use in patrol craft and small vessels of the navy and the coast guard craft as main propulsion engines, and also for DG sets of 500 KW and 750 KW capacity for general use in naval ships.

**1989-90 HIGHLIGHTS SHOWS:**

(i) Keels for Marine Acoustic Research ship for naval physical and oceanographic laboratory and inshore patrol vessel for coast guard were laid.

(ii) GRSE launched a survey vessel for the Indian navy and an inshore patrol vessel for the coast guard. one inshore patrol vessel was commissioned for the coast guard.

**EXPORT AND FOREIGN EXCHANGE EARNINGS:**

The value of foreign exchange earnings increased from Rs.50.25 lakhs during 1980-81 to Rs.57.50 lakh during 1981-82. The way of export of its engineering products as
well as repairs to foreign flagged vessels. The value of exports were likely to be around Rs. 70 lakhs during 1983-84.

INDIGENISATION/IMPORT SUBSTITUTION:

During the year 1981-82, the company had been entered into a collaboration agreement with a USA firm for manufacture of 1600 TPH STACKER and 1000 TPH Reclaimers for the turnkey coal Handling plant of Farakka Super Thermal Projects. A number of items like Alternators, Cathodic protection equipment, Engine Order, Speed order and Centre Engine Telegraph, Emergency D.G. Sets, Fire and Bilge pumps etc., which were hitherto imported for the earlier series of seaward defence boats are now being indigenously manufactured.

The 26,000 DWT Bulk carrier MV LOK PRITI has been indigenously designed and has over 80% indigenous content and performed extremely well at sea trials and achieved all the designed performance parameters. In the field of general engineering, the Gun Carriage for 105 MM Mark-II Field Gun was developed with the help of development team of the Indian Army. The company have also developed and supplied 45-Tonne Bollard pull Auto Tensioning Towing winch for naval tug.

During 1982-83 various items and components like fire and Bilge pump 10 T.P.M., for ships AVCAT pumps, F.O. pump Drive parts and Fuel pipes for RV Engines, Auto change over switches, etc. have either been successfully developed or are presently under research (through the effort of the
company as well as through ancillaries) with a view to import substitution.

IN THE YEAR 1983-84 :

1. GRSE is constantly endeavouring towards increased indigenous content in the ships built by Garden Reach. The following items have, so far, been indigenised in the Company's workshops:

   Slow and medium speed Marine Diesel Engines in the HP range of 250 to 10,500 and Dock Machinery items like Windless winches, cranes, steering gear, fibreglass boats for use on board ships.

2. Following items have also been indigenised from local Ancillaries:

   Light fittings, Plugs, Sockets Signalling Lamps, Paternised light fittings, Junction Boxes, Panels, Emergency switches sockets, Controllers, Auto change over switches, Resilient Mountings, DS Category Batteries and other indigenous equipment used on board ships.

During 1987-88, the company has taken up production of medium and high speed Diesel Engines, Sophisticated dock machinery items such as Anchor Windlass, Mooring Winches, Steering Gear, Boat Davits, etc. GRSE have successfully developed indigenous designs for the construction of 26,000 DWT Bulk Carrier, Seaward Defence Boats, inshore Patrol vessel, survey vessel, ocean going Tug upto 40 T Bollard Pull, Fast Patrol vessel and various types of Fibreglass Reinforced plastic Boats.
The company has developed Telescopic Aluminium Helicopter Hangar and Marine Sewage Treatment plant, which were hitherto imported. The diesel engine plant; which manufactures the Bergen Diesel Engine, is keeping pace with the phased indigenisation programme.

The value of purchases from small scale industry was Rs. 3 crore approximately during the year 1988-89 as against Rs. 2.5 crore in 1987-88. GRSE has no captive ancillary units as several industries already established in and around Calcutta and Howrah adequately cater to its requirements.

6. GOA SHIPYARD LIMITED (GSL):

Goa Shipyard Limited (GSL) was established in 1957. Its activities comprise ship construction, repairs to ships and barges as well as associated general engineering works. GSL has undertaken construction of a variety of vessels for the Navy and Cost Guard, including classified, oilers, etc. for the commercial sector, the construction of passenger and Mooring vessels are in hand, apart from two Fishing Vessels already delivered; Refits to Naval and Coast Guard Vessels as well as repairs to ships calling at the local port are also undertaken.

HIGHLIGHTS:

During 1982-83; 2 Torpedo Recovery vessels, one Landing Craft Utility, 4 Exploratory fishing vessels and 11 Pontoons have been planned for delivery of which one Torpedo Recovery vessel. One Exploratory fishing vessel and 11
Pontoons have so far been delivered. The company also received during the year a sub-contract work from MDL for construction of one offshore Supply Vessel.

The value of production went up to Rs. 13.72 crores during 1982-83 as against Rs. 8.55 crores during 1981-82. Similarly, sales also increased from Rs. 1.53 crores during 1981-82 to Rs. 14.33 crores during the year 1982-83. During the year 1983-84, the company delivered 2 survey craft, 1 landing craft Utility, 1 Exploratory fishing vessel and hull of 1 offshore supply vessels.

During the year 1984-85, the company delivered to survey crafts and one seaward Defence Boat to the Navy and seven High speed Launches to Mazagon Dock Limited for export to Mozambique. Between April 1985 and October 1985, the company delivered one Seaward Defence Boat; two Landing Craft Utility, two ferry craft and one OPSSV were also excepted to be delivered within the year 1985-86.

During 1988, GSL delivered the following ships:

(i) One 10 Ton Tug for the Indian Navy.
(ii) One 30 Ton Bollard pull Tug VSP Tractor Tug for the Mormugao port Trust.
(iii) One 400 Ton oiler for the Indian Navy.
(iv) One 10 Ton Bollard pull Tug built for the Indian Navy.
(v) 20 Ton Tug built for the Indian Navy.
EXPORT EFFORTS:

During 1983-84, the company has not so far exported any vessel directly. However, in the past the company constructed and delivered to Mazagon Dock Limited various types of flat top barges and pontoons meant for export by them. 7 Launches were under construction in 1983-84.

Large scale ancillarisation is not possible in view of the peculiarities of the shipbuilding industry. However, efforts are continuously being made to develop and encourage small scale units in Goa. The company does not have an ancillary unit as yet. The total value of purchases from the small scale units during 1983-84 was of the order of Rs. 28.53 lakhs.

During 1984-85, the company constructed and delivered soon High Speed Launches to Mazagon Dock Limited for export to Mozambique.

INDIGENISATION/IMPORT SUBSTITUTION:

Import of raw-materials, stores and components for various vessels under construction is done at the specific request of the purchasers of the vessels. However, some of the items which were originally intended to be imported have been subsequently indigenised.

The company has cultivated a number of sub-contracting firms to produce a variety of shipbuilding parts like Davits, Cranes, Anchors etc.
GSL has successfully indigenised engineering outfitting items such as Fuel Separator, Special Clamps, Pipe Hangers, Grids, Aluminium pipes, Foam Generator etc. which were earlier imported from the USSR Hull outfitting items that had been indigenised include Dished Tanks, Anchor chain, Anchor, etc. These are now being manufactured to Soviet standards. Special filler wire for aluminium fabrication and electrical outfitting items such as Galley equipment, Hangers, Glands, etc. to Soviet design have also been indigenised. Navigation Lights and Air Whistle are now being procured through domestic sources.

7. PRAGA TOOLS LIMITED (PTL):

Praga Tools Limited which was incorporated as a public Limited Joint Stock Company in the private sector in May 1943, was first taken over by the Ministry of Commerce in 1959. Its administrative control was transferred to the Ministry of Defence in December, 1963, in order to facilitate better capacity utilisation for the production of defence items. The company has a Machine Tools Division in Secunderabad and a force and Foundry Division in Hyderabad.

HIGHLIGHTS:

During the year 1982-83 the Company made impressive progress both in terms of value of production and turnover. For the first time in its history, the company crossed the mark of Rs. 10 crores both in production and sales (Value of production: Rs. 10.74 crores and sales: Rs. 11.05 crores).
During the year, it could wipe off completely the past accumulated losses and create reserves for Development Research and Investment Allowance amounting to Rs. 67.27 lakhs.

For the year 1983-84, the company has set a production target of Rs. 1499 lakhs and a sales target of Rs. 1450 lakhs. The company achieved upto end-October 1983 production of Rs. 585.29 lakhs and sales of Rs. 503.78 lakhs. With concerted efforts the company hopes to achieve the annual target of production and sales.

During the year 1983-84 the company made impressive all round growth in value of production, sales and profit. The net worth of the company has gone upto Rs. 5.95 crores. The company achieved upto the end of October, 1984, production of Rs. 7.27 crores and sales of Rs. 5.53 crore.

The company further improved its performance during the year 1984-85 its value of production was Rs. 18.22 crores and its sales Rs. 17.07 crores (These figures include excise duty of Rs. 1.32 crores). In its modernisation drive, the company has added 2 high value machines-CNC machining centre and CNC Lathe. An in house computer has also been installed.

**EXPORTS AND FOREIGN EXCHANGE EARNINGS:**

The company earned foreign exchange of Rs. 19.09 lakhs during the year 1981-82 as compared to Rs. 9.48 lakhs during the previous year.
The export target for the year 1982-83 is fixed at Rs. 75.00 lakhs. Vigorous promotional efforts are being made to develop markets particularly in developing countries by establishing direct contract with the customers, Machine Tool Dealers and also through EEPC offices, Indian High Commissions and Embassies.

The company exported goods worth Rs.79.78 lakhs in 1982-83 earning considerable foreign exchange. During 1984-85, the company exported goods worth Rs. 1.07 crores compared to Rs. 0.9 crore in the year 1983-84. PTL has secured substantial export orders for the current year and the next year which should help to increase the value of exports in 1985-86 to Rs. 6 crores.

INDIGENISATION/IMPORT SUBSTITUTION:

The infeed attachment on a major accessory of GF had been indigenised during the year 1982-83 and indigenisation of GF carriage was under progress.

The import content of all PTL products except the copy Lathe is very marginal. Indigenisation of components of the copy Lathe is continuing and during the year 1983-84 indigenisation efforts on this product have resulted in a net saving of Rs. 19.12 lakhs. Import substitution in the field of new Models of Thread Rolling Machines is underway. Items like big Castings, hydraulic power pack and fabricated base are now indigenised. The new range of thread rolling machines is being built with 100 percent indigenous content
for the basic machine. The incremental 300 Tube Finning and Pulley forming Machine will also be manufactured indigenously.

8. BHARAT DYNAMICS LIMITED (BDL):

Bharat Dynamics Ltd. (BDL), Hyderabad, was incorporated in 1979 with the primary objective of establishing a production base in the country for Guided Missiles.

HIGHLIGHTS:

As the phase I production of the Milan weapon system is due to commence in 1984-85, BDL has undertaken short term loads from various public sector undertakings and other sources like Department of Defence supplies and R&D units to utilise existing capacities to the extent possible. Another short term project, i.e. Door Left Assemblies for LL-70 gun was taken up, during 1982-83 for the Department of Defence Supplies. The items were produced and delivered within schedule.

The building for phase I production programme of second generation ATGM has been completed. The production of this missile is likely to commence shortly. The Anti-Submarine Rocket (AGB-25) was delivered to the Navy as per schedule during 1983-84. The delivery of intended quantity of RGB-25 will be completed during 1985-86.
Further 50% of the planned production of NST-58 is expected to be achieved. The company is likely to submit the initial lot of evaluation trials of 122 MM Rocket HE Fragmentation to the Army by the end of 1984-85.

The company during 1983-84 incurred a loss of Rs. 3.13 crores and likely to earn a profit of Rs. 0.91 crore during 1984-85. During 1988-89 a new project is being established, with foreign collaboration, at Medak in Andhra-Pradesh, for the production of Kunkurs Missile system.

INDIGENISATION/IMPORT SUBSTITUTION:

The level of indigenisation achieved for the first generation missiles was 72 percent and 82 percent for its warhead. This project came to close in June, 1982. The next project i.e. second generation anti-tank missile is scheduled to come into production only in 1984-85, and BDL have already initiated action for indigenisation of components.

The only major project involving imported items is second generation ATGM, import substitution for this missile is being progressed actively and a few items have already been indigenised. Import substitution for the second generation Anti Tank Guided Missile is being progressed successfully. A number of items have been indigenised resulting in considerable foreign exchange savings.

Against a programme of indigenisation of 259 items for the Milan, till now 237 items have been indigenised in respect of konkurs, 5 technology packages consisting of 2557
components involving 217 grades of metals and nonmetals have been identified for indigenisation. The company is taking up a crash programme for this in collaboration with various public, private sector undertakings and national institutes.

9. **MISHRA DHATU NIGAM LIMITED (MIDHANI)**

Mishra Dhatu Nigam Ltd. (MIDHANI), Hyderabad was incorporated in 1973, as a Defence Public Sector undertaking for the manufacture of special metal and superalloys required for the strategic, sophisticated industries like aeronautics, space, defence, atomic energy, chemical engineering etc.

**HIGHLIGHTS:**

Integrated facilities in the plant were commissioned in December, 1982 and commercial production has commenced from July 1983. During the year 1981-82 and 1982 Midhani has been engaged primarily in trial production for transfer of technology exercises. Nevertheless, it was able to effect sales to the tune of Rs.3.20 crores and Rs 5.18 crore during the past two year.

Commercial production in the plant commenced in July 1983. Commercial production from the cores and Lamination shop has also commenced from October, 1984. During 1983-84 Production has picked up with the Hot Rolling Mills becoming Operational making available the required inputs for the down stream operations covering the hot rolled, cold rolled and drawn products. The company has achieved higher sales in 1983-84, at 1096 T valued at
Rs.8.58 crores as compared to the despatches of 723 T valued at Rs.5.18 crore in 1982-83. During the year 1984-85 1052 T of sales valued at Rs. 17.82 crores were anticipated.

The value of production achieved up to October 31, 1985 has been Rs. 1123.90 lakhs compared to Rs. 922.29 lakhs. during corresponding period of previous year. The major break through achieved by the company in 1987-88 was that it come out of the red and made a small profit for the first time after providing nearly Rs. 7.5 crore for depreciation.

ITEMS EXPORTED AND VALUE OF EXPORT :

A beginning has been made on the export front and MIDHANI has supplied 33 kgs of Superheat 80, valued at US $ 542.40 to M/S Metal work Electrical contracts (PTE) Ltd, singapur during Septembar, 1984, enquiries for supply of Titanium alloys to Bulgaria have been received. During 1984-85 MIDHANI has secured an export order from Bulgaria for supply of 4.18 T of titanium and alloys valued at Rs. 19.5 lakhs. The major break through achieved by the company in 1987-88 was that it came out of the red and made a small profit for the first time, after providing nearly Rs. 7.5 crore for depreciation.

INDIGENISATION/IMPORT SUBSTITUTION :

The Company's manufacture and sales of Titanium products in the country, mostly for the chemical sector has resulted in considerable savings in energy requirement of chlor alkali industries. Manufacture of molybdenum wires for lamp manufacture has also reduced the import requirement of
this item. Nickel chromium grade of heating elements manufactured by MIDHANI are also finding a market inspite of the stiff competition from imports. The company has also developed crores of iron-nickel alloy to the specification of C-Dot which is required by the communication Industry in large quantities Hitherto, these were imported.

MIDHANI's entire efforts is to replace imported material and significant success has been achieved in its becoming an established sources for a variety of products which include alloys Molybdenum, Tungsten Titanium etc. Apart from the development of grades covered by collaboration agreements in house development work on a number of items has been undertaken, notable amongst them being margining steel required for space application and adoped tungsten for filament applications.

MIDHANI was set up with collaboration from M/S Creusot loire, France, M/S Krupp Stahl AG, West Germany and M/S Pechiney-Ugine-Khhlmann, France. In the last four years of operation substantial progress has been made in the transfer of technology and productionising of grades that have sound market acceptability. Efforts are also being made to develop other grades not covered under agreements. The company has so far developed 40 grades of alloys indigenously.

INTRODUCTION OF RECENTLY PRODUCED DEFENCE SECTOR ITEMS:

India has tounched its indigenious and of the art Main Battle Tank (MBT) "Arjun", Comparable to contemporary
world tanks after successfully overcoming several hitches which had plagued it from its inception. MBT Arjun has been launched in March 1993. India will exhibit Arjun in 1994 annual tank exhibition to be held in Canada. Defence Minister said, "The tank Costing Rs. 7 crore per unit should be able to find enough buyers after they are inducted into the Indian Army and also said, the Arjun could save a lot of foreign exchange and uncertainties arising out of the current impasse in the supply of T-72 tanks for the Indian Army from Russia".

The tenth launch of the improved indigenous medium-range surface-to-surface missile "prithvi" was successfully carried out from the interim test range; Prithvi is one of the five missiles under various stages of development programme (IGMDP). The missile is currently under production at the public sector Bharat Dynamics Limited, Hyderabad and is likely to be inducted by the army in near future. Developed indigenously, the missile uses a liquid propellant with almost all the components made in the country. It is a modified version of the indigenous satellite Launch vehicle (SLV3). It was lounched on August 20, 1992.

Defence exports last year (1989-90) were Rs. 79 crores and expected to reach Rs. 120 crore in 1990-91. The Defence Export for few year's is 500 crore. Defence exports of Rs. 79 crore from the country in 1989-90, Rs. 56.11 crore came from Bharat Earth Movers Ltd. which makes mainly earth moving equipments.

Indias ordnance factories which are the main stay of the country's arms production exported virtually nothing, although the latest annual report (1990-91) of the defence ministry says that a number of enquiries are following in from foreign buyers. "An export order of Rs. 14 crore has been secured, which will be executed in the next two years", says the report.

In 1989 India became the 6th nation in the world capable of making intermediate range ballistic missiles (IRBM). Her 19 metre long and 14 tonne two stage missile "Agni" lifted off successfully from the interim Test Range at Chandipur on May 22, 1989.

PILOTLESS TARGET AIRCRAFT (PTA):

Three successful flights of the indigenously designed and developed pilotless Target Aircraft (PTA) "LAKSHYA" were carried out by the DRDA scientists at the interim test range near Chandipur on September 16, 17 and 21, 1992.

UNMANNED REMOTE CONTROL:

Air vehicles, designed as live practice target for air and ground missiles and long range artillery guns, had demonstrated their capability to fly at altitude ranging up to nine K.M. down to 300 metres over the sea at a variable speed of 750 KMPH with a flight endurance exceeding 40 minutes.
INDIGENOUS HELICOPTER:

India's first indigenous helicopter was successfully flown in Bangalore on August 30, 1992. Test pilots took the Hindustan Aeronautics Limited, Advanced Light Helicopter (ALH) prototype through a series of manoeuvres on its maiden flight.

In all, HAL will make four prototypes, production on a commercial scale is expected to begin in 1995. The Indian Navy's newest submarine, the indigenously built "INS SALKI" was commissioned on Feb. 7, 1992 in Bombay.

The Mazagon Dock Ltd. was building three numbers project-15 destroyers which are the largest type of warships being built in India. Two more missile boats were also under construction, of which one was to be commissioned in March, 1992.

The Navy has a sizable Air Arm with various types of fixed wing, air craft and helicopters such as super constellation, IR-38, Alizes, Sea Harriers, Islanders, Sea Kings, Alsutter and KA-25. There are used in various roles such as maritime reconnaissance, anti-submarine work, search and rescue, logistic functions such as lifting troops and supplies, air interception, ground support and anti shipping. Six Leander class frigates, INS-NILGIRI, HIMGIRI, UDAIGIRI, DUNAGIRI, TARAGIRI, VINDHYAGIRI, one ship of indigenous design INS-GODAVARI, two survey ships INS-SANDLAYAK and INS-NIRDESHAK, Seaward Defence boats, Harbour utility and ocean
going tugs. A mooring vessel and patrol craft have been built indigenously and commissioned.

The coast guard fleet comprises ships such as KUTHAR (EX-NAVY) VIKRAM, VTIJAY, VEERA (indigenously built), a number of offshore patrol vessels and a number of inshore patrol vessels.

Today in Indian Air force there are more than 50 squadrons comprising combat, transport, liaison and reconnaissance aircraft/helicopters. There are more than 1000 aircraft and helicopters of which the main types are Canberra, Hunter, Ajeet, Kiran, Chetak, MiG-21, 23, 25, 27 and 29, Sec.-7, AN-32, 11-76, Mi-8, Jaguar and Mirage-2000 (Mostly indigenously built in India). In addition to purchase from abroad, India also designs and makes her own aircraft.*

India is pursuing the technology for designing exported items in itself-by import substitution. Most of defence items, India has got self independency in this way, the items, which were exported earlier from abroad, reduced for ever from the list of imported items, because India has already been participating for export market (by pursuing import substitution). In this way India is earning much foreign exchange cut down in import and by given importance to import substitution.

### TABLE - 6.8 : UNDER 20 ECONOMIC PROGRAMME

Turnover (Sales)/Development of Ancillaries and encouragement of small Scale Sector.

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<td>1. HAL</td>
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<tr>
<td>Ancillaries</td>
<td>46 L</td>
<td>54 L</td>
<td>75 L</td>
<td>10 C(E)</td>
<td>110 L</td>
<td>180 L</td>
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<tr>
<td>Small scale Sector</td>
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<td>300 L</td>
<td>7.38 C</td>
<td>10 C(E)</td>
<td>7.40 C</td>
<td>7.88 L</td>
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<td>2. BEL</td>
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<td>Ancillaries</td>
<td>68 L</td>
<td>0.7 C</td>
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<td>3.29 C</td>
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<td>Small scale Sector</td>
<td>350 L</td>
<td>4.78 C</td>
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<td>8.9 C</td>
<td>11.6 C</td>
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<td>3. BHEL</td>
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<td>Ancillaries</td>
<td>10.57 C</td>
<td>7 C</td>
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<td>28.62 C</td>
<td>42 C</td>
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<td>4. MDL</td>
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<td>Ancillaries</td>
<td>7.23 C</td>
<td>11.56 C</td>
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<td>Small scale Sector</td>
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<td>5. CSL</td>
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<td>Ancillaries</td>
<td>19.34 L</td>
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<td>6. GRSEL</td>
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<td>Ancillaries</td>
<td>134 L</td>
<td>3.78 C</td>
<td>1.88 C</td>
<td>2 C(E)</td>
<td>2.5 C</td>
<td>3 C</td>
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<td>Small scale Sector</td>
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<td>7. PTL</td>
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<tr>
<td>Ancillaries</td>
<td>74 L</td>
<td>95.85 L</td>
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<td>Small scale Sector</td>
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<td>8. RDL</td>
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<tr>
<td>Ancillaries</td>
<td>13.59 L</td>
<td>39.12 L</td>
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<td>Small scale Sector</td>
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<td>9. NIDHANI</td>
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<tr>
<td>Ancillaries</td>
<td>24 L</td>
<td>60 L</td>
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<tr>
<td>Small scale Sector</td>
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**NOTE:** Here L&C indicates, Rs. in Lakhs and crores respectively and E in bracket indicates estimated value of rates.
DEFENCE PRODUCTION:

INTRODUCTION:

The Ordinance Factories (OF's) organisation consists of 38 OF's with a manpower of 1.73 lakhs, which produce more than 1500 items of arms, ammunition, equipments and components. At the apex level, the Ordinance Factories Organisation has a board, titled Ordinance Factory Board (OFB). The Director General of Ordinance Factories (DGOF) is the ex-officio chairman of the OFB, and is assisted by nine members who are incharge of various staff and line functions. There are five staff function divisions and five operating divisions, each under the charge of a member/additional DGOF, administrative control over the OF's exercised through the five operating divisions. Three divisions each under a member function from Calcutta, while on each an additional DGOF at Kanpur and Avadi.

TABLE-6.9 : DISTRIBUTION OF THE DIVISIONS OF ORDINANCE FACTORIES

<table>
<thead>
<tr>
<th>Division</th>
<th>No. of Factories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Materials and Components</td>
<td>10</td>
</tr>
<tr>
<td>2. Weapons, vehicles and Equipments</td>
<td>10</td>
</tr>
<tr>
<td>3. Ammunition and Explosives</td>
<td>10</td>
</tr>
<tr>
<td>4. Armoured vehicles</td>
<td>4</td>
</tr>
<tr>
<td>5. Ordnance Equipment Group</td>
<td>5</td>
</tr>
</tbody>
</table>

The factories are also classified as metallurgical (6), Engineering (16), Filling (5), Chemical (4), Ordnance Equipment (6) and miscellaneous (2) Group of factories.
DEFENCE SUPPLY:

With the objective of enabling the civil industrial sector playing a Complementary role for achieving self-reliance in arms, ammunition and other equipment required by the armed forces, the department of defence supplies was set up in 1965. Since its merger with the department of defence production in December, 1934 it has been functioning as the supplies wing of the department of defence production and supplies.

FUNCTION:

The supplies wing of the department of defence production and supplies is entrusted with the following function:

- Indigenisation of imported defence stores and equipment through the civil sector.
- Production in the civil sector of new stores and equipment development by the defence R&D purchases from the Civil Sector industry of all items required exclusively for defence including those off-loaded the ordnance factories.

INDIGENISATION THROUGH CIVIL SECTOR:

The items which are selected by the technical committees for indigenisation pertain to both the maintenance requirements of main equipment as well as systems/sub-systems required by the production units in the defence sector, for production of original equipment. The selection of items for
PROGRESSIVE VALUE OF ORDERS PLACED BY THE DEPARTMENT OF DEFENCE PRODUCTION AND (SUPPLIES WING)

UP TO FEB. 1990

DEFENCE PROD./SUPPLY
indigenisation is influenced by the following considerations:

(i) The requirement of the item is large enough to make indigenous manufacture economically viable;

(ii) Need to establish self-reliance on strategic consideration, even if it may not be economically viable;

(iii) Technology for production of the item is available in the country or can be developed; and

(iv) Drawing and specifications are available or can be made from the samples through the process of reverse engineering.

ACHIEVEMENTS:

The department achieved a major break-through in the level of ordering since 1981-82, as will be evident from the following table and the bar chart facing this page.

**TABLE 6.10: ACHIEVEMENTS**

<table>
<thead>
<tr>
<th>Year</th>
<th>Value of supply orders placed (Rs. in crore)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981-82</td>
<td>84.08</td>
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<tr>
<td>1982-83</td>
<td>78.46</td>
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<tr>
<td>1983-84</td>
<td>142.15</td>
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<tr>
<td>1984-85</td>
<td>149.72</td>
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<tr>
<td>1985-86</td>
<td>224.53</td>
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<tr>
<td>1986-87</td>
<td>277.41</td>
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<td>1987-88</td>
<td>245.73</td>
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<tr>
<td>1988-89</td>
<td>134.02</td>
</tr>
<tr>
<td>1989-90</td>
<td>170.55</td>
</tr>
</tbody>
</table>
For the year 1983-84, till 31st December 1983, the value of the order placed was well over Rs.100 crores. Total value of orders placed by it since its inception adds up to Rs.350 crores covering around 57000 items, while the actual supplies stood materialised up to Rs.525 crores.

Actual supplies during 1982-83 amounted to about Rs.67 crores against orders worth Rs.78.75 crores. Due to the very nature and type of work involved in indigenisation, the actual materialisation of supplies do not keep pace with the placement of orders. However, the indigenisation efforts and the value of the supplies received have been steadily increasing every year.

New fabrics, terrycot olivegreen, for the army uniforms have been developed. An order for 30 lakhs meters of fabric was placed on the National Textile Corporation. The cloth has already been delivered. A repeat order for 15 lakhs meters has been placed on them. The total cost of orders placed on the National Textile Corporation since 1982-83 was for about Rs.22 crores. A special type of garment which has been developed through the assistance of Defence R&D is garment disruptive; which will be the new Combat uniform for the army replacing the cotton cellular and drill olivegreen. This cloth has been developed indigenously and orders to the extent of Rs.28 crores have been placed on as many as 20 firms in 4 cities i.e. Calcutta, Kanpur, Delhi and Bombay out of those 19 are small scale entrepreneurs.
The Department achieved a break-through in 1983-84 by achieving an ordering level of Rs. 140 crores as against about Rs. 80 crores in the earlier years, in the year 1984-85 orders was placed for stores of the value of Rs. 149.72 crores upto December, 1985, the value of supply orders placed had exceeded Rs. 224.53 crores orders placed since 1981 is given in the chart in the year 1986-87 the value of supply orders placed reached the peak figures of Rs. 277 crores out of which Rs.125 related to ab initio development. Of the order amounting to Rs. 245.73 crores placed in 1987-88, Rs. 229 crores related to ab-initio development during the year 1988-89, on account of budgetary constraints, there has been a reduction in the value of indents placed by the armed forces. However, it is expected that the total number of items to be covered by orders during the current year will be more than the corresponding number during the previous year.

The value of orders placed by the supplies wing for the items requiring ab-initio development is an indicator of the success achieved in involving the civil sector in defence production. While the average annual or ordering during the fifth plan period was of the order of about Rs. 55 crore and about Rs. 100 crore during the 6th five year plan, the level of ordering during the first three years of the 7th plan period has been about Rs. 220 crore. During the year 1988-89, on account of budgetary constraints there was a reduction in the value of indents placed on the TC's as a result of which the level of ordering came down to Rs. 134.02 crore. During the current financial year, however, the level of ordering is expected to be well over Rs. 200 crore.
Orders of the value of Rs. 177.55 crores had already been placed till the end of December 1989.

It is government's policy to see that the infrastructure and capability available in the civil sector for manufacture of defence items (excluding sensitive and lethal items) is exploited to; the maximum extent possible, with a view to minimising new investments in the defence sector. Consistent with this approach, about 50% of the systems required for the manufacture of the new combat vehicles in ordnance factories have been earmarked for development and production by civil industry (both public and private). The response from the civil industry to take up this challenge has been encouraging it is expected that the majority of the required systems would be available in time to meet the production schedules of the two vehicles.

During the past few years, the civil sector has made rapid strides in building up a technological base and other infrastructural facilities for production of defence cores. This has made it possible to entrust to the civil sector the production of critical assemblies and sub assemblies of sophisticated equipment being production in the defence sector. Productionisation in the civil sector of the complex assemblies/sub assemblies of BMP-11 vehicles and T-72 Tanks boars eloquent testimony to the capability of this sector. Out of 186 assemblies/sub assemblies of these combat vehicles planned for productionisation in the civil sector, the Bulk Production Clearance (BPC) in respect of 106 has already been accorded.
SUPPLIES TO CIVIL TRADE AND EXPORT:

Although ordnance factories are primarily geared to production of equipment required by the armed forces, considerable diversification, utilisation of spare capacity and skills to meet civil requirement has also been achieved by these factories. Civil trade transactions accounted for an earning of Rs.28.66 crores in 1982-83 as compared to Rs.23.20 crores in the previous year, primarily in the area of meeting the requirements of state police forces, para military forces as well as the needs of field sports; signalling equipment for Railways and supply of explosives to a variety of consumers is also a step in the direction of meeting diversified consumer demands.

Spare Capacities and skills in ordnance factories have been utilised to meet the demands of the state police forces, para military forces, railways etc. An amount of Rs. 37.83 crores was earned in 1983-84 as compared to Rs. 2.32 crores for 1982-83, from civil trade.

Major items of sale to the indigenous civil sector are sporting weapons and ammunition, for signal for railways, binoculars, microscopes, strip film projectors, are field lighting, MS drums and barrels, clothing and leatter items, acids and castings, forgings and various rolled sections. Rs.32.44 crores was earned from the civil trade during 1984-85.
The ordinance factories participated during the year in major trade in India and abroad including the India International Trade Fair, 1985 at Delhi and the Asian Defence Exhibition at Kualalumpur.

By utilising available space capacities and skills, the factories' product items for the civil trade valuing Rs. 32.78 crore during 1987-88. There items included sporting weapons and ammunition, for signals, for railways, acids and chemicals, industrial grade, nitrocellulose and blasting explosives for coal and mineral mining. Marketing of 32" revolver commenced during the year.

Ordnance factories earned foreign exchange valued at Rs. 4.40 crore during 1987-88, though exports of their products.

Due to the budgetary constraints of the services, because of which the target for value of production for 1988-90 has been kept lower than that for 1988-89, the ordnance factories board has been permitted to solicit business from non-defence users. The board has been able to secure certain orders for execution during 1990-95.

To achieve export business, the board has also participated in defence exhibition held in Ankara and Bagdad. Other areas of manufacturing activity having potential for diversification include sporting weapons and ammunition for civil trade, for signals, for railways, acids and chemicals. Industrial grade nitrocellulose, blasting explosive for coal
and mineral mining during 1988-89, the ordnance factories undertook work for the civil sector work Rs. 30.73 crore and earned foreign exchange worth Rs.3.59 crore through exports.

During the years 1989-90, 1990-91, the value of civil trade were Rs.58.88 crores and 102.34 crores respectively. Amount of profit earned from foreign exchange were Rs.10-96 crores in 1989-90 and Rs.13.47 crores in 1990-91.

CIVIL TRADE:

Over the last few years there has been a steady growth in the value of Civil Trade, but there was decline in foreign civil trade as the following table would show:

TABLE-6.11 : CIVIL TRADE

(Rs. in crores)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Value of Civil Trade</td>
</tr>
<tr>
<td>28.66  37.83  32.44  39.98  33.93  30.73  58.88  102.34</td>
</tr>
<tr>
<td>Foreign Exchange Earned From Civil Trade</td>
</tr>
<tr>
<td>During 1986-87 to 1990-91</td>
</tr>
<tr>
<td>(Rs in Crores)</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>1986-87  87-88  88-89  89-90  90-91</td>
</tr>
<tr>
<td>2.46    4.41   Negligible   -    -</td>
</tr>
</tbody>
</table>

Say G.C., Katoch, formerly aditional secretary and financial advisor to the defence ministry "The problem of ordnace factories is that many of them especially the older ones, are grossly overmanned and therefore productivity is
low. However, quality wise their product are fine, because they have to match up to rigorous army standards."

The other obstacle that could come in the way of export is India's political leaning. India being a nonaligned country, a high sales pitch of weaponry must also require clearance from the foreign ministry. This is because, from the foreign policy angle, sales of weapons to some countries may not be desirable so on the whole, despite his enthusiasm and initiative, power does not have an easy task on hand.

ENGINE FACTORY- AVADI:

In May 1984, Government approved the setting up of an Engine Factory (project) near factory 'A' for indigenous production of engines and loose components as spares for a type of tanks (AE engine) and a type of infantry combat vehicle (CE engine) with a total investment of Rs.150 crores.

The project for indigenous production of engines sanctioned at a cost of Rs.166.44 crores with planned date of completion as February 1989 has been mostly completed (March 1993) bearing installation of Flexible Manufacturing System (F.M.S)

INDIGENISATION:

The process of indigenisation involved development of 51 main codes and 39 sub-codes. Out of these, 21 main codes

*Business India Sept. 2-15, 1991 p.81, 84.
were to be developed by the factory. Development of the remaining main codes and all the sub codes was the responsibility of DDS. While the indigenisation through DDS was established in respect of all the main and sub codes entrusted to them. The ministry stated (March 1993) that the project was established to satisfaction and no imports were done beyond 1991-92.

INFANTRY COMBAT VEHICLE:

Government accorded sanction in June 1984 for setting up a new ordnance factory for indigenous production of a certain number of infantry combat vehicles (ICV) at a capital investment of Rs. 366.84 crores, which was later (July 1986) enhanced to Rs.379.24 crores.

The factory was to produce 1250 vehicle II by March 1992, but orders from the army were for 800 vehicle II up to March 1991. In view of the increase in cost of the vehicles, the army was not in a position to place larger order on the DGOF.

The factory produced 750 vehicles II against the demand of 800 up to March 1992 and there were no firm demands form army beyond 800 vehicles II.

Based on initial requirement of army, factory imported (March 1992) 143 sets vehicle II K—another type of vehicle II at a cost of Rs. 57.27 crores.
Due to delay in receipt of engines for vehicle II from engines factory, 75 engines at a cost of Rs. 5.75 crores were imported till March 1992.

Whether engine factory might produced engines in proper orders time, it could have earned Rs. 63 crore as import substitution during 1991-92 (upto March 92).

INDIGENISATION:

The engine required for vehicle II was to be indigenised and accordingly for manufacturing the engines required for the vehicle II, sanction to set up a separate engine factory was accorded in April 1987 at an investment of Rs. 166.44 crores. The engine factory was to achieve peak indigenous production by 1991-92 but till end of March 1992, it was largely assembling the engines out of imported CKDS. As against a demand of 350 engines made by the factory in June 1986, the engine factory could supply only 113 sets till March 1992.

An order was placed in March 1989 on the PSU for the supply of 350 sets of the assemblies at a total cost of Rs.29.51 crores with the condition that 150 sets were to be supplied in 1988-89 and remaining in 1989-90. As against revised delivery schedule of 60 sets in 1988-89, 250 sets in 1989-90 and 40 sets in 1990-91, the PSU supplied 19 sets in 1989-90 and 175 sets in 1990-91 out of 117 sets fitted to the vehicles during the years 1988-89 and 1990-91.
IMPORT SUBSTITUTION AND ITS IMPACT ON BALANCE OF PAYMENT:

Import substitution is regarded by many developing nations as an important means to reduce trade gap and to develop the economy.

Import substitution may be defined as the substitution of a domestic source of supply for a foreign source of supply.

It is clear from this definition that import substitution implies:

(1) The protection of domestic industries against foreign competition, if the competitive disadvantage of the domestic industries, especially the infant ones, is encouraging the foreign source of supply;

(2) The expansion of the domestic production/supply, if the domestic supply is sufficient;

(3) The development or creation of new source of supply or productive capacity, if there is no domestic supply.

Import substitution is one of the important planks of the commercial economic policy of the developing countries. The foreign exchange scarcity created by the import-export gap has prompted these countries to lay emphasis on import distribution in a bid to reduce their import requirements and thereby to narrow or remove the trade deficit.

Import substitution has assumed importance in the Indian economic development policy since the second five year
plan. The large scale imports necessitated by the development 
requirements of the nation gave rise to what may be called a 
development disequilibrium in the balance of the payments. 
Export promotion and import substitution are the two 
important measures for narrowing down and ultimately wiping 
out the balance of payments deficit.

Industries and other sector with potential for import 
substitution have been given great importance in our 
development programmes. At the beginning of the planning era, 
India relied very heavily on foreign source of supply for 
the requirements of capital goods and numbers of basic and 
other important inputs.

In the last four decades, consideration import 
substitution has taken places in many important areas in 
capital goods, cement, organic chemicals, dye stuffs etc. 
Efficiency of devaluation through increase in exports (export 
promotion) and decline in imports (import substitution).

The increase in the volume of exports due to their 
lower foreign prices consequent on devaluation must be such 
that it more than off sets the loss in the foreign exchange 
earnings due to lower per unit realisation. This can be so 
when the foreigien demand for devaluing countries exports is 
relatively elastic i.e. the elasticity of imports demands 
for the products of the devaluing Country is more than 
unity. Then only foreign expenditure on devaluing countries 
exports will increase as their prices fall. This elasticity 
will be higher if the devaluing countries exports have degree
of substitutability. Then foreign buyers will spend more on devalued and therefore are relatively costly.

The value of this elasticity will still be higher if the share of the devaluing country in the export market is low. In order to drive the maximum advantage out of devaluation, it must be ensured that additional production will be generated to meet the additional foreign demand. This will happen only when the domestic elasticity of supply is high. This will moderate the rise in home prices, maximise the fall in foreign prices and call the impact of the favourable demand fully into play.

If the elasticity of foreign demand or the domestic supply is lower than unity, the increase in devaluing country's exports will not be sufficient to offset the decline in foreign earnings due to devaluation. The balance of payments deficit will be greater than before.

If the elasticity of demand for exports is less than unity, the unfavourable effect of devaluation will be minimised if the value of the elasticity of supply of exportables is low. This will leave foreign prices relatively unchanged and thus cause little decline in foreign expenditure on devaluing country's exports.

In general, a nation which turns out a large number of products that are sold in a large number of markets is more likely to experience elastic demand condition than a nation which sales a relatively small number of products in
only a few markets the greater the number of products, apparently the better are the changes of increasing export receipts.

DECLINE IN IMPORTS OR IMPORT SUBSTITUTION:

The decline in the volume of imports due to their high prices must be such that it more than offsets the increase in foreign exchange expenditure due to the increase in per unit price. This can be so when the domestic demand for imports is relatively elastic, i.e. more than unity. This will cause the expenditure on imports to decline as their prices rise. The elasticity of demand for imports will be high if there is high degree of substitutability between imported items and domestically produced goods. This will cause the domestic buyers to shift their expenditures from imports to the domestic import competing goods.

In general, a deficit in the balance of payments can be eliminated through devaluation only when the sum of the elasticity of the foreign demand for devaluing country's exports and the domestic demand for devaluing country's imports is greater than unity.