EXECUTIVE SUMMARY

0.1 INTRODUCTION

0.1.1 The manufacture of commercial vehicles in the country started in 1948. Initially the production was of only light commercial vehicle of jeep and car derivation. Within a few years the heavy commercial production overtook the LCV production and by early sixties the heavy commercial production was four times the light commercial vehicle production.

0.2 PROFILE OF THE INDUSTRY

0.2.1 Details of HCVs produced from 1981 to 1991 is given below.

Year	Production (Nos)	Manufacturers (Nos)
1981	65234	5
1982	61393	4
1983	60120	4
1984	61767	4
1985	66106	4
1986	56791	3
1987	64662	3
1988	70102	3
1989	72107	3
1990	88103	3
1991	89324	2

0.2.2 In the years 1948-50, only 764 HCV were assembled from imported CKD packs, which was the pattern in the initial years. Manufacture of components was taken up gradually and currently indigenous content is 90%. The average growth in production in different periods has been fluctuating between 2.5% and 14.5% (as analysed over 5-year periods.).

0.2.3 Currently there are only two main producers of HCVs viz. TELCO & Ashok Leyland. They, between them, account for 99% of the total production. Premier Automobile & HM who were among the early manufacturers have given up production of HCVs. A recent entrant is Kirloskar Cummins, but

they are producing a small number. The production of individual manufacturers in 1990 and 1991 was as under:

	1990			1991		
	Buses	**Trucks**	**Total**	**Buses**	**Trucks**	**Total**
Telco	11514	52080	63594	12188	52512	64700
AL	8759	15037	23796	9767	14857	24624
HM	48	665	713	-	73	73
	20321	67782	88103	21955	67442	89397

0.2.4 All manufacturers started with foreign technical know-how. Telco & Ashok Leyland have been carrying out their own development and have brought out different models developed with in-house R&D. Premier and Hindustan Motors did not have the same extent of inhouse development for HCVs as their main activity was passenger cars. Gradually they lost their market share and gave up HCV manufacture.

0.2.5 The export from 1988-89 to 1990-91 were as under:

Year	No.	Value in Rs lakhs
1988-89	NA	9197
1989-90	4106	12060
1990-91	5321	16816

The 1990-91 exports were 4.8% of the turnover of the two manufacturing companies.

0.3 TECHNOLOGY STATUS - INDIVIDUAL MANUFACTURERS

0.3.1 Ashok Leyland

To start with, basic product designs were obtained from Leyland Motors of U.K., who were the collaborators and majority share holders. R&D inputs were therefore available on improvements etc. from the foreign principals. However in eighties, Ashok Leyland entered into a collaboration with ZF of Germany for manufacture of synchromesh transmissions for the drive line, and improved efficiency.

The company has a strong R&D department and has been developing new models to suit different applications e.g.

- Multi axle vehicles.
- Double decker bus chassis.
- Articulated buses.
- Special applications for fire fighting, defence & other applications.
- Improvements to engine for better performance.

In eighties, they entered into collaboration with HINO Motors of Japan for manufacture of modern fuel efficient engines of 4-6 litres with clean emission and Leyland Vehicles for improved cabs. They have recently (1991) entered into collaboration with Iveco for the latest diesel engines.

R&D division of Ashok Leyland has also been working on improvements to existing vehicles in the field of fuel efficiency, exhaust emissions, better life etc. Currently they are also working on development of a light commercial vehicle and additional vehicles in the medium range.

For designing and development of new engines, they entered into a fresh collaboration, when they needed a new engine for some application.

0.3 Tata Engineering & Locomotive Company (TELCO)

Original collaboration entered in 1954, was with Daimler Benz, which continued till 1969. Still there is minority foreign share holding.

Telco has a very strong R&D department and has been developing new models of vehicles, new engines, making improvements in components etc. Some of its achievements are:

- Model 1210 with 7.5 T pay load.
- 692 DI engine.
- Model 1210 E improved version.
- Model 1516 with turbo charged engine.
- Model LPT 1312.
- Models 407 & 607 LCVs

- Tatamobile pick up.
- Tata Sierra Jeep type vehicle.
- Tata Estate.

Telco R&D has also worked on improvements in existing engines for fuel efficiency, noise, pollution reduction, improved safety and reliability.

Telco R&D is also active in production technology improvements covering:

- Value engg. and cost reduction
- Development of SPMs
- Development of machine tools
- Development of dies and tooling.

Recently (1992) Telco are considering collaboration for the manufacture of Daimler-Benz engine for export.

0.3.3 Hindustan Motors

The company initially had collaborations with Vauxhaul Motors of U.K. and General Motors of USA. However they have concentrated on passenger cars and more or less dropped out of the commercial vehicle sector. They entered into collaboration in 1984 with Isuzu Motors Japan, with a view to again enter into commercial vehicle field. They also manufactured a few vehicles, but they found that due to sharp appreciation of the Yen, their vehicles were not competitive and hence they gave up production of HCVs.

0.3.4 Premier Automobiles Ltd.

They had initial collaboration with Chrysler of USA for commercial vehicles. Over the years they have concentrated on passenger cars and reduced commercial vehicle manufacture. For the last 6 years, they have not produced any commercial vehicle.

0.3.5 Simpsons Ltd.

Simpsons are primarily manufacturers of Diesel Engines. They had attempted production of commercial vehicles in 1979 and 1980 but gave it up as they could not compete with Ashok Leyland and Telco. They collaborated with Ford Motors Co. UK to produce the Simpson Ford D1200 series trucks and buses.

0.3.6 Kirloskar Cummins Ltd.

They are also manufacturers of Diesel Engines and have taken up manufacture of trucks and buses from 1989. The truck is evolved by Company's own engineers using known proven aggregates readily available in the market. The luxury coach is based on integral construction concept based on Neoplan of Germany. Their production has been very limited.

0.3.7 Ancillary Manufacturers

The ancillary manufacturers are well developed. Many of them are also making substantial exports. They are prepared to develop further improved design of components if there is sufficient demand. It is thus necessary for HCV manufacturers to give them the lead.Inspite of good results shown by the ancillary manufacturers they do not have easy access to quality materials at international prices, commercial tool rooms for die and mould making and appropriate NC/CNC machinery.

0.4 TECHNOLOGY STATUS - VEHICLES

There are a number of areas in which vehicles in India are not upto the international level and need to be brought up, if they are to be competitive in international field. These areas are discussed in the following paragraphs:

0.4.1 **Power**: The power per tonne of Indian vehicles is quite low, being around 6, as against normal 9 and as high as 26 for international vehicles. One major reason for higher powered vehicles not having been developed in India is the poor road conditions and narrow roads, which do not permit road speeds comparable with developed countries. Another reason for non-use of lighter power vehicles is the absence of the luxury coach segment and the use of auxilliary equipment in specialist vehicles which require higher horse power engines. Air conditioning, ventilation, heating systems, lighting systems, coolers etc, are some examples which require higher HP engines than currently available.

Although roads are poor and narrow many national highways are multilane and permit higher speeds and would demand high powered vehicles for reducing journey times in the near future.

0.4.2 **Fuel Efficiency**: The fuel consumption per BHP hour is around 200 gms for Indian vehicles compared to around 150 gms achieved by many of the models in the developed countries. The Indian manufacturers are seized with this problem and with the liberalisation in industrial licensing and

technical know how import, both Telco and Ashok Leyland have gone for fresh collaborations for manufacture of world class engines, Telco with Daimler Benz of Germany and Ashok Leyland with HINO of Japan and IVECO of Italy. It is reported by Ashok Leyland that they have already achieved 156/158 gms/BHP hour with HINO engines. These latest engines meet international fuel consumption levels. Table given below shows the data of internationally available engines.

WORLD ENGINE DATA

Capacity Range (Litre)	Rated RPM Range	Power Range (Ps)	Torque Max (Kgm)	Min SFC Range (gms/hr)	Max SFC Range (gms/ Kwh)	Specific weight (Kg/Ps)	Aspiration
5.655-6.870	2400-3000	100-140	30-43	154-198	224-281	2.96-4.24	Natural
5.480-6.870	2400-2800	130-182	43-60	151-161	222-246	2.38-4.18	Turbo-charged
5.480-6.240	2500-2800	200-212	43-66	143-154	216-227	2.51-2.85	Turbo-charged

Source : Diesel Engine for Europe - Commercial and Passenger Vehicles '40 - 600 KW

0.4.3 **Pollution**: The pollution levels of Indian vehicles are higher than those in the developed countries. Government has laid down the exhaust emission norms which are being worked by the Indian Industry. Also tighter exhaust emission standards are proposed from 1995. Noise pollution levels are also under consideration by the Government and are expected to be issued in the near future. Ministry of Environment, Government of India, has notified limits of external noise of vehicles which have to be compiled with from 1.1.94.

0.4.4 **Use of Electronics**: Electronics is extensively used on commercial vehicles in developed countries, the important areas being:

- Engine Mangement Systems
- Vehicle Control Systems.
- Diagnostic Systems.

Indian manufacturers at present do not have any plans to use any electronics in commercial vehicles. It would be essential to fit the electronic systems on vehicles to be exported to developed countries. It would also be useful to fit electronic controls in safety areas such as, antilock brakings, anti-jackknifing devices even on Indian vehicles also.

0.4.5 Use of special materials, such as, ceramics and ceramic coating for increased life of components and increased fuel efficiency and composites for weight reduction, are still in experimental stages, even internationally. However, Aluminium alloys for tanks, radiators, crank cases etc. for weight reduction and corrosion resistance are extensively used.

0.5 RESEARCH & DEVELOPMENT

0.5.1 The vehicle manufacturers have well established R&D organisations but R&D expenditure as a percentage of the turnover is low being 0.7 to 0.75% against 3 to 5% in advanced countries. Here it is important to note that in view of lower emoluments of engineering staff in India and other factors, R&D expenditure may not be as high as in developed countries and for the present, a target of 1.5 % of turnover may be adequate.

Manufacturers feel that R&D requires substantial investments on sophisticated capital equipment and testing facilities. Even on revenue account, cost of components is likely to be substantial. They, therefore, feel that there should be no import duty on equipment and components required for R&D purposes.

0.5.2 R&D establishments of Indian manufacturers have carried out good work and industry has brought out numerous new models based on own R&D work.

0.5.3 Many of the larger ancillary manufacturers have in-house R&D departments and have been meeting higher technology requirements of vehicle builders by own R&D or by import of fresh technology.

0.5.4 There are also R&D institutions like ARAI and VRDE with extensive test facilities who have been assisting the automotive industry in various matters, such as:

- Testing & certification of vehicles for road worthiness, fuel efficiency, exhaust emissions etc.
- Sponsored work on testing and/or improvement of various components.
- R&D work in exhaust and noise emissions to assist in developing industry standards.
- Sponsored work on behalf of vehicle manufacturers for improvement in existing models.

0.5.5 In addition, Bureau of Indian Standards is laying down various standards for vehicles performance, component design and performance etc. in association with the automotive industry and is periodically revising the standards.

0.6 TECHNOLOGY GAPS :

Main developments in the world still not introduced in India are detailed below:

0.6.1 Engines

- Specific output 1 HP for 2 kg wt. of engine.
- Specific fuel consumption 150 gms/BHP hours. However, Indian HCV manufacturers feel that the target for domestically produced vehicles would be 165 and 170 gms/BHP hours, considering the poorer grades of fuels and lubricants.
- HP/1000 cc 30-35 HP/litre of swept volume.
- Minimisation of exhaust emission and noise levels as per tight specifications of the developed countries.
- engines using CNG, Methanol or other alternative fuels.

0.6.2 Transmission

- Automatic transmission.
- Automatic gear changing systems.
- Range change/splitter gear boxes.
- Two-speed rear boxes.

0.6.3 Suspensions

- Parbolic springs
- Reinforced fibre glass springs
- Single and multi-steel taper leaf springs
- Rubber suspension system.

0.6.4 Brakes

- Electric & Hydraulic retarders

- Anticlock braking systems
- Electronically controlled brakes
- Infrared sensors for driver's warning when there is insufficient braking distance.
- Anti-Jackknifing devices for tractor trailor combinations and vestibule buses.

0.6.5 Steering

- Electronically controlled power steering
- Adjustable & collapsible steering columns

However Telco is using power steering on some Tata vehicles from 1980 onwards.

0.6.6 Vehicle Configuration

- Multi axle vehicles & tractor trailor combination for large capacity.

0.6.7 Others

- Fibre Optic Instruments (abroad these are at experimental stage).
- Comfort features such as suspension seats, noise reducing floors, adjustable steering columns.
- Aerodynamic body, low floor design buses, road spray control, wind deflectors.
- Safety seat belts.
- Ventilation systems.

0.7 RECOMMENDATIONS

0.7.1 Limited collaborations for improvements to the existing engines, other sub-assemblies specially in electronic software consultancy which is the current trend should be preferred to fresh full collaborations wherever it is not done presently. Limited collaborations are more economical both in initial costs and in import of components.

0.7.2 Issue of laying down a life limit for commercial vehicles may be considered after which commercial vehicle can be condemned with a view to :

- reduce fuel consumption

- reduce pollution levels
- cut out unsafe vehicles
- generate additional demand.

0.7.3 Indian manufacturers may earmark larger resources for R&D. An initial target can be 1.5% of turnover to be reached in 3-4 years.

0.7.4 Vehicle manufacturers must specially concentrate on R&D in following areas :

- Improvement in fuel efficiency.
- Reduction in exhaust pollution.
- Reduction in noise pollution
- Increased life of components.
- Reduced servicing requirements
- Quality improvements
- Cost reduction for same or better quality.
- Developing vehicles for special defence use in mountaineous sub zero temperatures and dusty desert conditions.
- Qualifying for ISO - 9000.

0.7.5 Some design improvements adopted by manufacturers in developed countries for fuel efficiency are listed below which should be considered by HCV manufacturers.

- Turbo charging of engines
- Fuel injection nozzles with lower sac volume and fuel pumps with higher injection pressure.
- Pistons with fewer rings for reduced friction.
- Cooling fans which can be switched off, when not required.
- Reduction in weight of engine components.
- Improved and matched drive train.

0.7.6 Vehicle manufacturers and component manufacturers can usefully employ services of specialist consulting firms or institutions, local or foreign, in the above work to complement their own R&D.

0.7.7 Vehicle manufacturers should improve customer education for operation and maintenance by :

- Good operating and maintenance manuals
- Network of approved service points
- Availability of spares at reasonable cost
- Publicity through media.

0.7.8 Sponsored R&D in areas of common interests may be considered with national institutions such as ARAI, VRDE, CMERI, Road Research Institute, IIT or technical educational institutions etc. Some areas for consideration are:

Material

Study into development and use of better materials such as

- Stronger & lighter steel alloys
- Corrosion resistance alloys
- Aluminium alloys
- Ceramic components
- Powder metallurgy components
- Plastics.

Pollution

Identify necessary modifications in existing vehicles to conform to specified exhaust pollution standards, decide on noise pollution standards, identify actions necessary on older vehicles to meet the specified standards.

Fuel Quality Improvement

Studies for improving quality of fuel and actions necessary to make such fuel available.

Lubricating Oil Quality Improvement

Studies into improved performance of lubricating oil so as increase period between oil change.

Road and Traffic Improvements

Items needing study and attention are:

- Improved surfacing of roads.
- Adequate lanes of proper width on highways.
- Minimisation of checkposts.
- Bypasses for cities and town for highways.
- Improved planning of intersections and junctions.
- Use of multi axle vehicles and tractor trailor combinations.

CNG Use

- Development of CNG fuelled buses & trucks for town
- Special incentives for use of CNG fuelled vehicles
- Provision of infrastructure. Gas pipe lines, gas filling stations.

The exact programme for each item may be decided by the Government in consultation with automobile industry and concerned institutions (ARAI, VRDE, IIP, Road Research Institute, etc.)

0.7.9 There is need for joint effort of vehicle manufacturers with specialised institutions, by utilising the extensive facilities provided at such institutions and the expertise developed by them for developing improved vehicles.