NATIONAL TRANSPORT RESEARCH CENTRE

FAR8MK

BUS MAKE STUDY

NTRC-38

M. A. FAROUK
DEPUTY CHIEF

MARCH, 1980

TABLE OF CONTENTS

S.No.	I. TEXT	PAGE NO.
1.	Historical Background of Road Transport.	1
2.	Some facts of Road Transport in Pakistan.	4
3.	Objective of Study.	13
4.	Need for the Study.	15
5.	Constraints of the Study.	17
6.	Methodology of Study.	18
7.	Change in initial Scope of Data collection.	24
8.	Parameters for Bus performance.	26
9.	Disadvantages of using unsuitable Bus makes.	30
10.	Analysis of data	32
11.	The Good performance Bus	34
12.	Selection of most suitable Bus Makes	42
13.	Performance of same Models in various agencies	47
14.	Performance of various Road Transport Corporations in Pakistan.	51

II. TABLES

1-0 :	Karachi Metero Politan Area daily Passenger Miles.	8
1-1 :	Buses sample for study.	18
2-0 :	Details of the Study Sample.	22
3-0 :	Details of Bus Makes and Models	33
3-1 :	Cumulative Mileages.	35
3-2 :	Fuel consumption.	36
3-3 :	Lubricating oil consumption.	37
3-4 :	Battery Expenditure	38
3-5 :	Tyres Expenditure.	39
3-6 :	Maintenance Expenditure.	40
3-7 :	Performance of various Models.	41
3-8 :	Intercity Models.	43
3-9 :	Models operating on urban routes	45
3-10:	Same Model in various agencies	48
3-11:	Fuel and Maintenance costs Bedford, 1974 in four agencies	49
3-12:	Performance of Road Transport corporations in Pakistan.	50

III. APPENDIX

I. Original comprehensive Questionnaire 52

II. Revised Questionnaire 56

III. Table 2-1 : Mileage 57

Table 2-2 : Fuel consumed(Gallons of Diesel oil) 58

Table 2-3 : Lubricating oil consumed (Gallons of Mobiloil) 59

Table 2-4 : Battery Expenditure 60

Table 2-5 : Expenditure on Tyres 61

Table 2-6 : Maintenance Expenditure 62

Table 2-7 : Revenue Earned 63

Table 2-8 : Same Model in various agencies 64

Table 2-9 : Same Model in OFF/ON Road position 65

Table 2-10: Different Models in PRTB 66

Table 2-11: Different Models in PUTC 67

Table 2-12: Different Models in SRTC 67

Table 2-13: Different Models in KTC 68

Table 2-14: Different Models in NWFP,GTS 68

1. HISTORICAL BACKGROUND OF ROAD TRANSPORT

In the Indo-Pakistan Sub-continent road transport started assuming importance only after the first World War. The Motor Vehicle Act of 1914 was the first all India enactment for controlling motor vehicles. Prior to this, the provinces had their own Acts and a motor vehicle leaving the jurisdiction of one province had to be re-registered. The Act did not differentiate between motor vehicles used for hire or reward and privately owned vehicles. Nor was any distinction made between different types of motor vehicles. In order to provide more adequate legislation, the 1914 Act was supplemented, in post-War years, by a number of provincial Acts, giving a great deal of thought to the question of codification of rules and regulations pertaining to road transport. However, it was felt that nothing substantial could be achieved without replacing the 1914 Act by a more comprehensive legislation.

Prior to 1945, road transport in the Provinces, now constituting Pakistan, was exclusively run by private operators. During the post-War period, the number of vehicles and quantum of traffic started multiplying. In order to organize and establish the Transport Industry on a sound footing, the Government

of the Punjab in 1945 decided to step into the field of road transport. Accordingly, nationalised transport service was undertaken on a small scale in Lahore and Rawalpindi as well as a number of inter-city routes. The operations were subsequently extended throughout the province under phased programme. Other provinces also drew plans to initiate schemes. Nationalised transport service was introduced in the NWFP in 1948. Sind followed suit in 1950.

In 1951, the Motor Vehicles Act of 1939 was amended, enjoining upon the provincial governments, to constitute "Road Transport Boards" to regulate the growth of public sector road transport. Three provinces viz Punjab, NWFP and Sind implemented this decision.

Following the intergration of various provinces into One Unit, various provincial Road Transport Boards were amalgamated into the West Pakistan Road Transport Board with effect from 15th October, 1957. The new Boards consisted of seven ex-officio members with one whole-time Chairman. The Central Government was represented on the Board by the Chief Commercial Manager, Pakistan Western Railway. The Board continued to function till early 1963 when it was felt that the arrangements were combersome and they unduly inhibited the growth and operation of public sector road transport in its efficient running.

Consequently it was decided to change the set-up of the Board to an autonomous corporation with effect from 17th May, 1965 with a whole time chairman, and two full time members (Finance and Administration).

With the dissolution of One Unit in June, 1970, the West Pakistan Road Transport Corporation was also dismembered. Three separate road transport corporations were created in the provinces of the Punjab, Sind and NWFP. From February 1, 1977, two Urban Transport Corporations were organised under the Federal Government to smooth out Urban Transportation - a sector confronting a multitude of problems. The Punjab Urban Transport Corporation (PUTC) is responsible for city bus services in Lahore and Rawalpindi-Islamabad while the Karachi Transport Corporation (KTC) tackles the marathon bus transport operations in the Karachi Metropolitan Area which is also serviced by private bus companies.

2. SOME FACTS OF ROAD TRANSPORT IN PAKISTAN

(a) Bulk of passenger haulage on Inter-city routes is done by the Private Sector and the number of passenger buses is increasing rapidly.

(b) Major part of Fleet of buses in the Private Sector belongs to single bus owners from lower middle class.

(c) Passenger Transport in urban areas is the statutory responsibility of the Public Sector. The latter is operating City Bus Services in Peshawar, Rawalpindi/Islamabad, Lahore, Lyallpur, Multan Hyderabad and Karachi and Suburban Services at Several Places. The service provided is inadequate.

(d) Rapid growth of population in the cities and inadequacy of service provided by the Public Sector as a result of mushroom growth of multifarious bus fleet, difficult to maintain and repair. There are unsurmountable difficulties in maintaining 25 makes of buses spread out in a large number of RTBs/RTCs depots all over the country.

(e) Maximum Bus fare is controlled by the Provincial Government under the Motor Vehicles Act. It is lower than the lowest in the world even after its recent augmentation.

(f) Vehicles in the country are of multiple makes and types. Storage of spare parts and their obsolescence has resulted in wastage of Foreign Exchange resources and made the maintenance of the vehicles difficult due to lack of specialisation.

(g) The basic reason for government involvement in Bus ventures is that provision of transport facilities over short distances in the cities is seldom profitable, owing to greater wear and tear of the fleet, larger over heads and employment of double shift staff. The capital required for an urban transport undertaking is much larger as compared to an intercity Bus undertaking.

(h) Management and operation of City Transport is a social service to the community and the return cannot and should not be measured in terms of money alone. The profit motive has to be kept latent and greater importance given to the efficiency and regularity of the service.

(i) Transport is one of the necessities of life. The consumer has to bear the increased cost as he does that of other necessities of life. Unless he is prepared to accept the increased fare, the losses of the Bus operator should be subsidised by the government.

(j) The public operators have experienced short-falls from 1970 to 1972 of Rs. 31.4 millions.

(k) The average speed of local buses in Lahore is 8 miles per hour and even if a Bus remains on road for 12 hours it would do only 96 miles. Average daily utility of a city bus in a crowded city like London is well over 150 miles.

STANDARDISATION PRACTICE IN DEVELOPED COUNTRIES: Bus operators abroad standardise their fleet as far as possible on one make with suitable specifications. London Transport has standardised on A.E.C. Double Deckers. Ribble Transport, Preston and Layland. Birmingham city Transport and Manchester city Transport is Leyland and Guy Double Deckers. Such examples can be multiplied. No country in the world has accumulated as many multifarious makes as Pakistan. The situation demands immediate action on policy for standardisation of few good bus makes for service in both the private and public sector.

URBAN TRANSPORT IN MAJOR CITIES: Karachi accomplish its foods and passenger transport demand through the use of at least 15 different technologies involving more than 80,000 highway-related vehicles and 100 rail-related vehicles. These range from individualized services such as rickshaws and taxis through mini-buses, trams, high-capacity buses and railway services. Each of these, services are provided at different frequencies and at different fare levels. This provides a multiple choice

service that could be tailored to the needs of all user groups, but the deficiencies of the public transport system reduce the range of effective choice drastically.

For over ten years, there has been a severe difficiency in city bus services which has resulted in excessive waiting, extreme overcrowding, unsafe vehicles, ill-trained drivers, and extreme hardship on the commuter having no choice of other modes of transport. An indication of such severe deficiencies can be found in the high proportion of total urban trips that are made by foot or cycle.

The lower-income population groups are the people most seriously affected by the present deficiencies in the transport system. Transportation is difficult and costly for them, and this limits their opportunity to seek out new jobs and other urban experiences, as well as imposing a severe strain on their budgets.

The loss in road costs, vehicle costs, fuel costs and accidents caused by the inefficiencies in the transportation system represents a constant drain on the City's economy.

* Table I-O: Karachi Metropolitan Area: daily passenger miles by mode and purpose, 1971

Purpose	Walk and cycle	Public transport	Private transport	Total
Work	768 000	5 432 000	918 000	7118 000
Non-Work	1 155 000	1 075 000	3 548 000	5778 000
Total	1 923 00	6 507 000	4 466 00	12896 000

* From Karachi Metropolitan Planning Project UNDP Report - 1974, KDA.

These figures show that nearly two-thirds of all trips and about 40 per cent of work trips are made on foot or by cycle, the vast majority being on foot. Nearly 60 per cent of all non-walk trips are by public transport, and nearly 85 per cent of non-work trips are by public transport.

While many people live close enough to their places of employment to walk to work some longer walking trips are made by very low income people for whom public transport, if available, is expensive. The average work journey on foot is 1.05 miles long, much further than people would walk if services were better.

The Bus System: The bus system carries about half of the non-walk trips made in Karachi, and is the most important component of the City's transport system. Unfortunately it suffers from serious management, regulatory and administrative problems which result in levels of service and travelling conditions which are as bad as or worse than those anywhere in the world.

Services are provided by both private and public sector operators. In 1971 the Karachi Omni bus service (KOS) providing the public sector services operated about 200 buses each day, while the many private bus

owners operated about 700 buses. Both sectors operate their buses 14-18 hours per day, but the private sector buses appear to be operated more efficiently. The total of 900 buses was far below the number needed to meet normal demand. Extreme overcrowding to the point of danger to bus passengers and other road users, and damage to buses, is every day phenomena. Breakdowns are frequent, spare parts are difficult to obtain, and buses are frequently unserviceable for long periods.

The KOS has acquired more than 1,000 new vehicles and 500 used vehicles in the last 15 years. Of this total, approximately 300 vehicles are currently operating.

Many of the public operators possess vehicles which are less than 5 years of age, but they experience extreme difficulty in keeping them roadworthy due to maintenance and administration deficiencies. The private sector possesses older buses (one third over ten years old), but is much more successful in their maintenance.

In September 1972 the Karachi Planning Project reported that, "the private sector would seem to be in danger of contracting because of basic difficulties of operating urban services and poor financial return". "There is evidence that this has

happended during the past year. Many serviceable private buses now lie idle. The role of the private sector has been reduced from more than 1,200 operating buses in 1955 to approximately 650 in late 1973.

Three factors combine to prevent the improvement of the public transport situation. First, the fares charged to riders are too low to enable either public or private operators to provide acceptable levels of service. Second, Government has not established a policy for the role of the private sector or developed programmes to support it. As a result, operators encounter unnecessarily high expenses including much of the fuel tax, registration fees and unofficial payments demanded by the police. Third, attempts at public ownership and operation of bus transport have shown that the public sector is not an efficient supplier of bus services.

That there is ample private capital available for investment in bus transport is evidenced by the numerous new and excellently maintained private buses operating between Karachi and Hyderabad, and the large number of minibuses exploiting the inadequacy of the full-sized bus transport system. Fares must be raised and support

provided for the private sector if public transport services are to be improved in Karachi.

Private operators generally own 1 or 2 buses but some large operators own from 10 to 30 buses. However, the number of operators owning more than 10 buses is very small as compared with others. These operators, being small, are not governed by various labour laws and regulations laid down from time to time and operate with distinct advantage over Government Transport Corporation/Board. Some of the important advantages are:

(a) Powers to hire and fire staff almost at will.

(b) Liberty to purchase one type of bus to reduce over-heads in maintenance and saving in stores inventory.

(c) Ability to purchase spare parts in open market on cash, and therefore at cheaper rates.

(d) Ability to replace old buses with new, as soon as profits start dwindling.

(e) Not sticking to any prescribed schedule, thus competing rather unfairly with public sector transport.

3. OBJECTIVE OF THE STUDY:

(i) The objective of the study is to reveal two or three most suitable bus makes for Intercity and Intra-city operations and bring out facts and figures against the present policy of indiscriminate import of all types of chasis for buses and two or three makes of proven dependibility selected for public sector road transport.

(ii) The study will help in standardisation of two or three makes of Buses for use by the Public Sector Road Transport. Private operators purchase buses of their choice which are available in the market. They normally choose one make, thus saving considerably on maintenance and replacement of spares. RTCs/RTBs, in contrast, are burdened with several makes not necessarily of their choosing. PRTB has about 15 different makes of buses and most of these makes are distributed in various proportions amongst all of their district services. This has an adverse effect on maintenance and spares holdings. The stores inventory becomes large and thus expensive to maintain, adding avoidable burden to the finance of RTCs/RTBs. The maintenance repair and overhauls suffer as the entire range of spares required to repair the buses is not always readily available.

Standardisation is considered desirable, beneficial and, indeed, necessary for buses for use in both the Urban as well as provincial Road Transport Corporations. It has too obvious advantages to need recounting here. However, it may be mentioned that the only way to progress towards assembly and eventual manufacture of a city or an intercity bus in Pakistan is to select and standardize a make right now. The make selected for induction now should be standardized and progressively assembled/ manufactured in the country.

The experiment of trying multifarious makes and types of buses has been tried long enough by the Corporations. The West Pakistan Road Transport Croporation had as many as 25 makes of buses in its Fleet in 1970, on the eve of its dismemberment and the formation of three Provincial Corporations. The West Pakistan Road Transport Corporation thus faced immense difficulties in the procurement of spare parts for efficient maintenance of the Fleet. The blockade of capital on spare parts alone was colossal and worse still was the loss due to their obsolescence.

(iii) To carry out a comparative evaluation of the performance of various makes both for Urban and intercity Transport Operations.

(iv) Recommen those makes for future purchases, which have given the best results as revealed by this study.

4. NEED FOR STUDY

Buses of multifarious makes are in operation with the public sector road transport corporations in Pakistan. This creates difficulties in procurement and storage of spares from so many diversified sources and problems in maintenance and servicing. As a result, many buses remain off the road and RTCs are losing revenues. Certain bus makes from East European Countries (Romania, Hungary), though cheaper in initial cost of purchase, proved a failure in operation with RTCs.

In the past the policy regarding decisions for ad hoc import of various makes of the buses were based more on expediency rather than on long-range planning. It seems that the guiding principle had so far been the availability of easier credit terms and cheaper costs. No attention was paid to the suitability of the imported makes to our conditions. Consequently Road Transport Corporations became the owners of an extremely hoterogeneous fleet. No attention was paid to the logistics problem it created concerning the securing of spare parts for the buses to keep them running. Also no notice was taken of the fact that certain makes were not suitable to our conditions, especially in urban operations. Time and again the

durability and dependability of certain makes was proved but this fact was ignored while framing import policies for acquiring the fleet for the public sector road transport.

Maintenance costs start escalating after five years of service, making further operation of the vehicle uneconomical.

The maintenance procedure and facilities of various Road Transport Corporations are inadequate. However, it is not always the lack of training and sense of responsibility on part of the staff resulting in poor performance of various Bus makes. Public Transport Corporations have a collection of various type makes some of which are difficult to maintain and repair because of their inherent unsuitability for conditions in Pakistan.

Practical experience has shown that the cost of maintenance, repairs and renewals of spare parts after the first three years of life for most of the Bus Makes is tremendous and it increase with age of the vehicle. Price of spare part and cost of repairs have gone up manifolds.

The saving on purchase of new vehicle will be nullified by the loss due to repairs and renewals/spare parts if correct makes of Buses are not purchased.

5. CONSTRAINTS OF THE STUDY:

This study has been completed under constraints and at times it appreared that it will not be possible to complete the study. The greatest difficulty was that of collection of data from the various RTBs/RTCs at Karachi, Hyderabad, Lahore and Peshawar. It took 7½ man-months against the sanctioned 4 man-months for collection of data. The Public Sector Road Transport Corporations were short of staff were in process of completion of some organisational changes (creation of federally and ministered Urban Transport corporations, KTC & PUTC from Ist February, 1977). Moreover the corporations do fairly maintain records but storage is not systematic and it is very difficult to retrieve information from the records packed in gunny bags and dumped in dark and damp corners.

The NTRC field staff were forced to make many trips of prologned stay at various stations to dig out the necessary data, for this study. Difficult conditions forced NTRC data collection staff reduce the size of sample and no data on old buses prior to 1967 could be collected.

Inspite of all these constraints, the hardwork of the NTRC field staff mode it possible to obtain a fairly good sample for this study.

6. : METHODOLOGY OF STUDY

The following methodology has been followed for the study:

(i) QUESTIONNAIRE: Since the study involved lot of field data to be collected from the Public Sector Road Transport Corporations, a questionnaire was very carefully designed for data collection purposes. A copy of the questionnaire appears as Annexure = I to this study. The questionnaire includes relevant questions on all the necessary items of technical/ economic data required for the study.

(ii) REPRESENTATIVE SAMPLE: The Public Sector Road Transport Corporations possess 'on road' and 'off road' buses in thousands and for purposes of this study, a representative sample of all makes and model, 'on' or 'off' road was collected. Data pertaining to a total of 197 buses with the five public sector RTBs/RTCs was collected as detailed below:

Table 1-1: Buses Sample for Study

S.No.	Agency	No. of Buses		
		On Road	Off Road	Total
1.	PRTB	16	32	48
2.	PUTC	27	9	36
3.	SRTC	21	13	34
4.	KTC	28	7	35
5.	NWFP,GTS.	33	11	44
	Total:	125	72	197

(iii) DATA COLLECTION IN FIELD: NTRC field staff (Economic Investigators) were assigned to personally visit Karachi, Hyderabad, Lahore and Peshawar to fill the questionnaire forms for 'on road', 'Off road' buses. The location of the different road transport corporations is listed as below:

(a) At Lahore:

Punjab Road Transport Board (PRTB) and Federally administered Punjab Urban Tranport Corporation (PUTC).

(b) At Karachi:

Federally administered Karachi Transport Corporation (KTC)

(c) At Hyderabad:

Sind Road Transport Corporation (SRTC).

(d) At Peshawar:

NWFP,Govt.Transport Service (GTS).

Collection of data in field proved a difficult task, mention of which is made in the paragraph'Study Constraints'.

(iv) OFFICE PROCESSING OF FIELD COLLECTED DATA:

Information shown on the questionnaire was directly transcribed on the same forms

under the space 'For office use'. In other words same form was used for field and office. This proved very convenient and a great time saver. It took aburt a month to transcribe data from 'field' to 'office' use shape for further processing by computer.

(v) DESIGN OF OUTPUT: Input data having been brought upto date and ready for computer processing, output tables(AnnexureII) were designed in line with study objectives. The performance comparison between different makes and models has been related to the mileage and number of months 'on road'. Due to abnormal and disproportionate escalation in prices of spare parts, tyres and battries, it was not possible to base comparison on 'expenditure incurred' basis. The following parameters have been compared for the various bus models and makes groups:

1. Mileage covered
2. Gallons of Fuel consumed.
3. Gallons of lubricating oil consumed.
4. Tyre changes.
5. Battery Changes.
6. Workshop repairs.
7. Revenue earned.

vi) PROCEDURE FOLLOWED FOR COMPARISON: Data pertaining to 197 buses of 25 different makes/models as listed in Table 2-0 has been analysed by computer processing.

(vii) FINDINGS OF THE STUDY: Based upon the results of seven sets of computer tables 2-1 to 2-7 in Appendix findings of the study have been described in detail and various Bus makes have been listed in order of good performance.

For comparison purposes - 'an average representative bus' for each make and model and category of operation(urban or intercity) was obtained by averaging the performance of each sample. The sample consisted from a minimum of 1(Bedford, 1974 on road) to a maximum of 20(Fiat,1974 on road). The variance in the size of sample were restricted by various factors e.g. the total number of buses of that particular make/model in the fleet 'on' or 'off' the road, availability of data etc. It was not possible to obtain data on buses in use earlier than 1967. Old records are difficult to find and in most of the RTBs/RTCs, these have been destroyed. So this study does not incorporate buses in use prior to 1967.

Table 2-0: DETAILS OF SAMPLE OF VARIOUS BUSES AS COLLECTED FROM RTBs/RTCs.

AGENCY		MODEL GROUP			Bus Serial Numbers.	No. of Buses.
	Code		Code No.	Abbrev.		
PRTB	2	BLMC,74 ONROAD	1	BLMC 74 ON	1 to 7	7
		BLMC,74 OFFROAD	2	BLMC 74 OFF	8 to 9	2
		FIAT,68 OFFROAD	3	FIAT 68 OFF	10 to 11	2
		FIAT,67 OFFROAD	4	FIAT 67 OFF	12 to 24	13
		BEDFORD 73 OFFROAD	5	BF 73 OFF	25 to 39	15
		ISUZU,75 ON ROAD	6	ISU 75 ON	40 to 48	9
					SUB TOTAL:	48
PUTC	5	BLMC,73 ON ROAD	7	BLMC 73 ON	49 to 53	5
		BLMC,73 OFFROAD	8	BLMC 73 OFF	54 to 61	8
		BEDFORD,74 ON ROAD	9	BF 74 ON	62 to 64	3
		BEDFORD,74 OFFROAD	10	BF 74 OFF	65	1
		ISUZU,74 ON ROAD	11	ISU 74 ON	66 to 79	14
		ISUZU,75 ON ROAD	12	ISU 75 ON	80 to 84	5
					SUB TOTAL:	36
SRTC	3	MOGURT,74 ON ROAD	13	MO 74 ON	85 to 87	3
		MOGURT,75 ON ROAD	14	MO 75 ON	88 to 92	5
		BEDFORD,74 ON ROAD	15	BF 74 ON	93 to 105	13
		FIAT,67 OFF ROAD	16	FIAT67 OFF	106 to 118	13
					SUB TOTAL:	34
KTC	4	MOGURT,75 ON ROAD	17	MO 75 ON	119 to 132	14
		MOGURT,75 OFFROAD	18	MO 75 OFF	133	1
		BEDFORD,74 ON ROAD	19	BF 74 ON	134 to 147	14
		BEDFORD,72 OFFROAD	20	BF 72 OFF	148 to 153	6
					SUB TOTAL:	35

NWFP, GTS	1	FIAT,74 ON ROAD	21	FIAT 74 ON	154 to 173		20
		FIAT 68 OFFROAD	22	FIAT 68 OFF	174 to 180		7
		BEDFORD,75 ON ROAD	23	BF 75 ON	181 to 186		6
		BEDFORD,74 ON ROAD	24	BF 74 ON	187 to 193		7
		BEDFORD,69 OFFROAD	25	BF 69 OFF	194 to 197		4
						SUB TOTAL:	44
						TOTAL:	197

7. CHANGE IN INITIAL SCOPE OF DATA COLLECTION

The initial scope of data collection was quite elaborate, in-corporating information on various body and engine characteristics, information required to compute overall operating, running and maintenance expenses per seat mile. Because of the difficulties in data collection, uncomparable and unparallel price rises of spares and fuel, it was later on decided to base comparison of various makes by mileage. Consequently the revised scope of study based performance comparison of various models/makes on the following parameters with mileage and months on road:

1. Mileage covered
2. Gallons of Fuel Consumed.
3. Gallons of lubricating oil consumed.
4. Tyre changes.
5. Battery changes.
6. Workshop repairs.
7. Revenue earned.

The original questionnaire form is attached as Appendix I to this report. It was a comprehensive data collection questionnaire listing information on as many as 76 items. This detailed questionnaire form seeking information on Bus purchase details, model year, body fabrication costs, total capital cost, custom duty and sale tax, economic life,

salvage value, engine characteristics, chassis, seating capacity, operational and workshop maintenance details, Battery and tyres replacement and other performance characteristics.

The original questionnaire was designed comprehensive for collection of all data relating to buses and Bus operations. The purpose was to store this data in NTRC and use the relevant items of information for any future study related to Bus characteristics or economics of Road Transport, intercity or intra-city.

But due to difficulties in collection of data from the RTCs/RTBs, it was decided to curtail original questionnaire and a revised Questionnaire (Appendix-II) was designed. It lists the following basic information needed for this study.

i) Agency
ii) Bus Make
iii) Model(Year).
iv) Status on/off Road
v) Date put on Road.
vi) Route (Urban/intercity)
vii) Seating capacity
viii) Capital Cost
ix) Life
x) Monthwise Mileage
xi) Monthwise Fuel consumed, Gals.
xii) Monthwise Lubricating oil consumed,Gals.
xiii) Monthwise Expenditure on Battery.
xiv) Monthwise Expenditure on Tyres
xv) Monthwise Expenditure on Repair/maintenance
xvi) Monthwise Revenue Earned, Rs.

8. PARAMETERS FOR BUS PERFORMANCE

Many factors such as the initial cost, economic life, carrying capacity, MPG, cost of maintenance and repairs, overheads etc go into the determination of cost effectiveness of a bus previously, except for the first two factors viz initial cost and economic life, the overall effect on cost of most other factors used to be generally only marginally different from one make to another.

Presently has been a phenomenal change in the economics of maintenance and repairs and this has resulted in higher running cost. In the final analysis, therefore, the equation between initial cost, running cost and economic life shall determine the cost effectiveness.

However, all efforts have been made to reduce all available information to one plane to make the comparison more objective. In the analysis comparison of various makes is based on mileage done and the number of months since the bus was put on Road'.

In comparative evaluation by computer, the following factors have been reduced to one plane for judging the performance of various makes/models:

i) Mileage done, Miles
ii) Diesel Fuel Consumption, MPG
iii) Lubricating Oil Consumption, MPG
iv) Tyre Wear, Paisas per mile
v) Battery changes, Paisas per mile
vi) Workshop maintenance, Paisas per mile
vii) Revenue earned, Paisas per mile

i) Mileage covered is a good basic indicator of bus performance and utilisation. Daily, monthly, yearly and life time mileages reflect the usefulness of bus.

ii) Fuel consumption is mainly a function of GVW and varies with speed, gradient, curvature, roughness, congestion speed cycle changes etc. The fuel consumption indicated by the manufacturers relates to 3/4th of maximum speed on a level tangent road at sea level and obviously refers to the target MPG that a vehicle can attain.

iii) Lubricating Oil consumption is a function of engine, gear-box and differential sizes and mileages. Its fairly accurate estimates can be made as firm data on engine etc, sizes and manufacturers recommendations for change at certain mileage are available. This item does not present any problem as its contribution to overall cost is also quite small.

iv) Tyres wear and tear depends upon roughness and speed. Road conditions in Karachi Lahore and Rawalpindi are almost the same. Average operating speed for different makes are also assumed to be the same i.e. 25 miles per hour in urban areas. Various studies give different values of tyre wear. The differences are to a large extent, due to quality of material, other things remaining the same. The tyres used by Government Transport agencies are sup posed to give a service of 40,000 miles. This is the yard stick adopted by the public sector agencies for change of tyres.

v) BATTERIES:

Life of the battery is taken as one year in the public sector transport corporations. The batteries usually used are a set of the 6/12 volts, Exide, manufactured by M/S. Chloride Pakistan Limited, Karachi. The battery costs are, generally, only marginally different from one make to another and therefore are of little significance in the overall maintenance expenditure for a bus.

vi) WORKSHOP MAINTENANCE AND REPAIRS:

The cost of maintenance varies from one bus make to another and affects the life and performance of the vehicle.

Higher expenditures on maintenance increases the running cost of a bus resulting in increased depreciation. Therefore maintenance costs during economic life of a vehicle, have to remain within reasonable limits.

The cost of spare parts is significant in maintenance costs. The free gift of Swedish buses proved very costly due to the very high price of spares supplied by the donor country. The cost of spares is generally assumed to be equal to 50% of the cost of chasis over the economic life of bus.

vii) CREW WAGES:

There is one driver and a conductor on a bus. The wages are the same in public sector road transport corporations and therefore this perameter is of little significance in our study objectives.

viii) REVENUE EARNED:

Revenue earned by a particular bus make every month and its lifetime earnings establish whether a bus has been a useful investment from economic point of view. If the return on the bus does not recover its capital cost, maintenance cost and running cost over its economical life, then it is not a sound proposition from 'return on capital' point of view.

9. DISADVANTAGES OF USING UNSUITABLE BUS MAKES

Slight deviation from prescribed standards proves very expensive in the long run. Not long ago the West Pakistan Road Transport Corporation imported English Double Decker Chassis of makes known for their operational efficiency i.e. Leyland, A.E.C. and Guy. Body building material suitable for these chassis was also imported. Due to lack of experience, however, the Bus bodies could not be correctly fabricated. Incorrect distribution of weight ratio cause damage to the Engines, Gear Boxes and Transmissions with the result that a large proportion of vehicles went off Road prematurely and raised the maintenance cost disproportionately. On the other hand 10 Guy Double Deckers complete with bodies imported for Lahore in 1950 remained on road for 20 years. So did 10 Leyland World Masters, 72 Seaters, imported in 1958.

The two urban (PUTC,KTC) and three provincial Road Transport Corporations are projecting for the purchase of hundreds of buses for city service. The Punjab Road Transport Board Sind Road Transport Service will be buying buses worth crores of rupees. It will be economical in the long run to recast the total requirement of buses and their projected capital cost in the light of these observations and purchase vehicles fit for urban operation.

So it is of vital importance to buy the most suitable makes the purchase price of which may not the lowest capital investment but prove more economical in the long run due to lower maintenance and repair costs and longer life. A good example in this connection is that of East European low price makes cepel and mogurt versus FIATS which are reputed for their good performance.

Eventual manufacture of Bases within the country would enable standardisation of vehicle and equipment as well as economies arising from low prices due to bulk production.

10. ANALYSIS OF DATA

Computer was used to analyse the data pertaining to the sample of 197 buses. These 197 buses were of 5 different makes and in 14 models. Out of the 14 models, 4 models are both in 'off road' and 'on road' condition, 4 are common in two agencies and one model is common in four agencies giving a total of 23 model Groups as detailed in table 2-0 and 3-0.

Table 3-0: Bus Makes and Models in the 197 Buses sample.

S. No.	Make	Model	Status	Agency	Model Group Number/S
1.	FIAT	1967	OFF ROAD	SRTC	16
		1967	OFF ROAD	PRTB	4
		1968	OFF ROAD	NWFP,GTS	22
		1968	OFF ROAD	PRTB	3
		1974	ON ROAD	NWFP,GTS	21
2.	BLMC	1973	ON ROAD	PUTC	7
		1973	OFF ROAD	PUTC	8
		1974	ON ROAD	PRTB	1
		1974	OFF ROAD	PRTB	2
3.	BEDFORD	1969	OFF ROAD	NWFP,GTS	25
		1972	OFF ROAD	KTC	20
		1973	OFF ROAD	PRTB	5
		1974	ON ROAD	PUTC	9
		1974	OFF ROAD	KTC	10
		1974	ON ROAD	SRTC	15
		1974	ON ROAD	KTC	19
		1974	ON ROAD	NWFP,GTS	24
		1975	ON ROAD	NWFP,GTS	23
4.	MOGURT	1974	ON ROAD	SRTC	13
		1975	ON ROAD	SRTC	14
		1975	ON ROAD	KTC	17
		1975	OFF ROAD	KTC	18
5.	ISUZU	1974	ON ROAD	PUTC	11
		1975	ON ROAD	PRTB/PUTC	6, 12

11. THE GOOD PERFORMANCE BUS

The best bus would give good mileage, consume less fuel, cost less on maintenance, be docked for repairs less frequently and make good revenue per seat mile. The various parameters affecting bus performance will be analysed for the 197 buses sample for this study.

MILEAGE PERFORMANCE:

The Mileage done is a good indicator of bus performance and utilisation. Good mileage means that the bus has stayed on road most of time, been docked for fewer days in workshop and has been utilised efficiently in service on the road. The study has revealed a mileage of 237,000 miles to 94,000 miles for the off road buses and 160,000 miles to 95,000 miles for 'on road' buses. The average monthly mileage has varied from 1612 miles to 4792 miles. Average monthly mileage (cumulative/lifetime mileage divided by no. of months in service) has been used for utilisation comparison of different models in the various agencies. In the public sector road transport efficient bus utilisation demands good mileage in the shortest possible time. It is not profitable to maintain a bus for a longer period as cost of its maintenance and repairs becomes uneconomic with age.

Computer analysis has revealed the following mileages for various makes:

TABLE 3 - 1

Bus Make	Model	Agency	Cumulative Mileage
FIAT	1968	NWFP,GTS	237276
FIAT	1967	SRTC	165593
BEDFORD	1975	NWFP,GTS	164033
BEDFORD	1972	KTC	163980
BEDFORD	1974	KTC	154361
BEDFORD	1974	SRTC	147883

FUEL CONSUMPTION:

The mileage done by the various 'off road' models in the road transport corporations varies from 94,000 miles to 237,000 miles. The fuel consumption varies from 10 to 15 MPG. A 15 MPG make would affect an economy of 4700 to 11,850 gallons of fuel. With the present price of diesel at Rs. 8.72 per gal (Rs. 1.92 per litre) an economy of Rs. 40,984 to Rs. 103,332 would result in using a bus doing more miles to a gallon of diesel. Computer analysis of the 197 buses sample has yielded the following results:

Table 3 - 2

Bus Make	Model	Agency	MPG(Diesel)
MOGURT	1974	SRTC	15.1
MOGURT	1975	SRTC	15.0
MOGURT	1975	KTC	13.6
BEDFORD	1974	SRTC	12.5
BEDFORD	1974	PUTC	12.2
BEDFORD	1975	NWFP, GTS	12.2
ISUZU	1975	PUTC	12.1
ISUZU	1974	PUTC	12.0

Same models in service with urban transport corporations have a lower MPG as compared to their operation on Intercity routes. Mogurt 75 and BedFord 74 in table above represent this point quite clearly. This is as expected because an urban bus has more stoppages and idling time at road crossings and stops than an intercity Bus.

LUBRICATING OIL CONSUMPTION

The lubricating oil unlike diesel fuel is of little significance in the overall cost of bus operation. The Mobil oil consumption has varied from 150 gallons to 1200 gallons for various models and makes.

With the present price of lubricating oil at Rs. 32 per gallon, the Average cost of lubricating oil during the lifetime of a bus is Rs. 21,600 as compared to Rs. 144,316 for the diesel fuel. It has been found that some lubricating oil is wasted through leaking oil seals and Gaskets irrespective of its use in the engine. Lubricating oil consumption by various makes as shown in the Table below:

Table 3 - 3

Bus Make	Model	Agency	Lubricating oil consumption MPG
BEDFORD	1975	NWFP,GTS	1006
FIAT	1968	NWFP,GTS	884
ISUZU	1975	PRTB	448
FIAT	1974	NWFP,GTS	407
BLMC	1973	PUTC	385
FIAT	1967	PRTB	363
MOGURT	1975	KTC	320

BATTERY EXPENDITURE

Battery Expenditure has been found to vary from paisas 1.15 to 4.88 for various bus makes. The battery life depends upon proper maintenance of battery, alternator and wiring of the electrical circuit.

Like lubricating oil, the contribution of battery expenditure is of little significance in the overall economics of bus operation. The computer analysis has revealed the following figures for various bus makes:

Table 3 - 4

Bus Make	Model	Agency	Battery Expd Ps per mile
FIAT	1968	NWFP,GTS	1.15
BEDFORD	1969	NWFP,GTS	1.74
FIAT	1974	NWFP,GTS	1.98
FIAT	1967	PRTB	2.10
ISUZU	1975	PUTC	2.13
BEDFORD	1974	NWFP,GTS	2.16
MOGURT	1975	KTC	2.21

TYRES EXPENDITURE

The road routes operated by the public sector road transport corporations have about the same road surface conditions all over Pakistan. Average operating speed for different makes are about the same but the study has revealed expenditures on Tyres from paisas 2.47 to 23.60 per mile for different makes as below:

Table 3 - 5

Bus Make	Model	Agency	Tyres Expd Ps per mile
FIAT	1974	(NWFP,GTS)	2.47
BEDFORD	1975	(NWFP,GTS)	2.48
BEDFORD	1974	(NWFP,GTS)	2.68
FIAT	1968	(NWFP,GTS)	5.47
BEDFORD	1969	(NWFP,GTS)	6.08
MOGURT	1975	(KTC)	7.35
FIAT	1968	(PRTB)	8.59

MAINTENANCE EXPENDITURE

Maintenance expenditure is the most important factor affecting economics of bus operation. A bus may cost less to buy but higher cost of its spares needed for its maintenance may offset this obvious advantage. The Bus which may cost less to buy may prove to be the most expensive over its economic life due to higher maintenance cost. The computer analysis has shown the following results on bus maintenance expenditures:

Table 3 - 6

Bus Make	Model	Agency	Maintenance Expd Paisas per mile
FIAT	1968	(NWFP,GTS)	11.28
FIAT	1974	(NWFP,GTS)	13.94
MOGURT	1975	(KTC)	18.51
BEDFORD	1974	(NWFP,GTS)	20.21
BEDFORD	1975	(NWFP,GTS)	20.43
ISUZU	1975	(PUTC)	26.67
BEDFORD	1974	(PUTC)	31.29

Table 3-7 PERFORMANCE OF VARIOUS MODELS

Model Group	Model/Agency/Status	Model Group	Model/Agency/Status	Model Group	Model/Agency/Status	Model Group	Model/Agency/Status
1.	BLMC,74/PRTB/ON ROAD	7.	BLMC 73/PUTC/ONROAD	13.	MOGURT 74/SRTC/ONROAD	19.	BEDFORD 74/KTC/ONROAD
2.	BLMC,74/PRTB/OFF ROAD	8.	BLMC 73/PUTC/OFFROAD	14.	MOGURT 75/SRTC/ONROAD	20.	BEDFORD 72/KTC/OFFROAD
3.	FIAT 68/PRTB/OFFROAD	9.	BEDFORD 74/PUTC/ONROAD	15.	BEDFORD 74/SRTC/ONROAD	21.	FIAT 74/NWFP,GTS/ONROAD
4.	FIAT 67/PRTB/OFFROAD	10.	BEDFORD 74/PUTC/ONROAD	16.	FIAT 67/SRTC/OFFROAD	22.	FIAT 68/NWFP,GTS/OFFROAD
5.	BEDFORD 73/PRTB/OFFROAD	11.	ISUZU 74/PUTC/ONROAD	17.	MOGURT 75/KTC/ONROAD	23.	BEDFORD,75/NWFP,GTS/OFFROAD
6.	ISUZU 75/PRTB/ON ROAD	12.	ISUZU 75/PUTC/ONROAD	18.	MOGURT 75/KTC/OFFROAD	24.	BEDFORD 74/NWFP,GTS/ONROAD
						25.	BEDFORD 69/NWFP,GTS/OFFROAD

MILEAGE				FUEL CONSUMPTION			LUBRICATING OIL CONSUMPTION		BATTERY EXPENDITURE		TYRES EXPENDITURE		MAINT.EXPENDITURE		EXPENDITURE ON TYRES BATTERY AND MAINTENANCE		MONTHLY AVERAGE REVENUE EARNED	
Model Grp.	Cumulative	Model Group	Average monthly	Model Group	PS/mile	MPG	Model Group	MPG	Model Group	Paisas per mile	Model Group	Paisas per mile	Model Group	Paisas per mile	Model Group	Paisas per mile	Model Group	Paisas per mile
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
22	237276	18	4792	13	57.80	15.1	23	1006	22	1.15	21	2.47	22	11.28	22	17.91	10	219
16	165593	21	4452	14	58.10	15.0	22	884	25	1.74	23	2.48	21	13.94	21	18.39	15	165
23	164033	6	4109	17	64.10	13.6	6	448	21	1.98	24	2.68	18	18.51	24	25.08	2	148
20	163980	12	3666	15	69.76	12.5	21	407	4	2.10	22	5.47	24	20.21	23	25.94	14	121
19	154361	24	3057	23	71.50	12.2	7	385	12	2.13	25	6.08	23	20.43	18	28.06	18	113
15	147883	19	2948	10	71.50	12.2	4	363	24	2.16	18	7.35	12	26.67	12	44.35	9	98
21	146284	11	2936	12	72.50	12.1	18	320	18	2.21	3	8.59	10	31.29	3	44.81	13	88
18	145636	17	2935	11	72.70	12.0	3	315	16	2.24	6	10.44	3	33.94	4	50.41	3	75
24	143644	3	2758	25	72.70	12.0	24	306	3	2.28	4	11.31	11	33.98	10	51.89	25	63
25	135426	15	2738	24	72.70	12.0	5	268	9	2.66	1	13.03	13	35.80	11	52.89	8	54
14	133772	20	2733	8	75.90	11.5	1	264	6	2.73	5	13.35	19	36.49	6	54.27	7	50
6	129672	14	2524	16	75.90	11.5	2	254	23	3.04	16	13.75	4	37.00	20	58.54	20	46
3	129626	1	2509	21	76.50	11.4	17	176	11	3.13	9	14.61	20	38.09	1	59.90	1	45
4	121323	23	2501	7	72.10	11.3	25	174	7	3.48	11	14.78	17	40.30	17	61.73	6	44
12	119294	9	2485	20	78.00	11.2	12	141	5	3.59	12	15.54	6	41.10	19	61.83	23	39
9	119280	10	2378	19	78.00	11.2	20	139	17	3.61	20	15.58	1	42.49	9	63.94	12	38
13	118193	16	2365	18	78.50	11.1	19	138	2	3.83	10	16.44	14	42.55	13	64.28	24	37
7	116251	2	2326	9	79.30	11.0	13	137	15	4.02	2	16.64	15	45.10	14	69.33	16	27
10	114161	4	2289	2	82.40	10.6	15	134	19	4.04	17	17.82	9	46.68	15	70.48	4	24
17	105555	13	2212	01	82.40	10.6	14	133	8	4.19	7	20.50	7	49.40	16	72.30	5	24
1	100373	5	2173	22	84.80	10.3	16	128	10	4.25	19	21.30	2	53.14	7	73.37	19	22
2	100045	22	1993	5	85.45	10.2	11	117	11	4.38	15	21.37	8	55.78	2	73.60	22	19
5	95639	7	1927	3	86.50	10.1	8	113	14	4.56	14	22.22	16	56.32	5	75.60	11	12
8	94817	8	1789	4	86.50	10.1	9	109	20	4.87	8	22.30	5	58.58	8	82.28	17	12
11	86824	25	1612	6	87.20	10.0	10	109	13	4.88	13	23.60	25	100.00	25	107.81	21	2

12. SELECTION OF MOST SUITABLE BUS MAKES

Based upon the discussions in foregoing paragraphs and the results listed in Table 3-7 selection of most suitable bus makes for intercity and urban operations is now possible.

(a) INTERCITY BUS: The various makes on intercity routes are listed below for selection:

Table 3 - 8: INTERCITY MODELS

Model Group No.	Make	Model	Agency	Status	Mileage	Fuel Costs MPG	Fuel Costs Rs/mile	Maint.cost ps/mile	Total fuel & Maint. costs.
22	FIAT	1968	NWFP,GTS	OFFROAD	237276	10.3	84.80	11.28	96.08
21	FIAT	1974	NWFP,GTS	ON ROAD	146284	11.4	76.50	13.94	90.44
24	BEDFORD	1974	NWFP,GTS	ON ROAD	143644	12.0	72.70	20.21	92.91
23	BEDFORD	1975	NWFP,GTS	OFFROAD	164033	12.2	71.50	20.43	91.93
3	FIAT	1968	PRTB	OFFROAD	129626	10.1	86.40	33.94	120.34
13	MOGURT	1974	SRTC	ON ROAD	118193	15.1	57.80	35.80	93.60
4	FIAT	1967	PRTB	OFFROAD	121323	10.1	86.50	37.00	123.50
6	ISUZU	1975	PRTB	ON ROAD	129672	10.0	87.20	41.10	128.30
1	BLMC	1974	PRTB	ON ROAD	100373	10.6	82.40	42.49	124.89
14	MOGURT	1975	SRTC	ON ROAD	133772	15.0	58.10	42.55	100.65

The five makes in service with the three Intercity Transport Corporations are listed in order of good performance as below:

1. Fiat
2. BedFord
3. Mogurt
4. BLMC
5. Isuzu

(b) CITY BUS: The various makes on urban routes are listed below for selection:

Table 3 - 9: MODELS OPERATING ON URBAN ROUTES

Model Group No.	Make	Model	Agency	Status	Mileage	Fuel Costs MPG	Fuel Costs Ps/mile	Maint Cost. Ps/mile	Total Maint.& Fuel Costs Ps/mile
18	MOGURT	1975	KTC	OFFROAD	145636	11.1	78.50	18.51	97.01
12	ISUZU	1975	PUTC	ON ROAD	119294	12.1	72.50	26.67	99.17
10	BEDFORD	1974	PUTC	ON ROAD	114161	12.2	71.50	31.29	102.79
11	ISUZU	1974	PUTC	ON ROAD	86824	12.0	72.70	33.98	106.68
19	BEDFORD	1974	KTC	ON ROAD	154361	11.2	78.00	36.49	114.49
20	BEDFORD	1972	KTC	OFFROAD	163980	11.2	78.00	38.09	116.09
17	MOGURT	1975	KTC	OFFROAD	105555	13.6	64.10	40.30	104.40
9	BEDFORD	1974	PUTC	ON ROAD	119280	11.0	79.30	46.68	125.98
7	BLMC	1973	PUTC	ON ROAD	116251	11.3	72.10	49.10	121.50
8	BLMC	1973	PUTC	OFFROAD	94817	11.5	75.90	55.78	131.68

The four makes in service with the two urban Transport Corporations are listed in order of good performance as below:

1. Mogurt
2. Isuzu
3. BedFord
4. BLMC

13. PERFORMANCE OF SAME MODEL IN VARIOUS AGENCIES

Five of the bus models are common in two or four of the five agencies as shown in Table 3-10:

Table 3-10: SAME MODEL IN VARIOUS AGENCIES

Model Group No.	Make	Model	Agency	Mileage	Fuel costs MPG	Fuel costs Ps/mile	Main.cost Ps/mile	Total fuel & Maint.costs Ps/mile
3	FIAT	1968	PRTB	129626	16.1	86.40	33.94	120.34
22	FIAT	1968	NWFP,GTS	237276	10.3	84.80	11.28	96.08
16	FIAT	1967	SRTC	165593	11.5	75.90	56.32	132.22
4	FIAT	1967	PRTB	121323	10.1	86.50	37.00	123.50
6	ISUZU	1975	PRTB	129672	10.0	87.20	41.10	128.30
12	ISUZU	1975	PUTC	119294	12.1	72.50	26.67	99.17
9	BEDFORD	1974	PUTC	119280	11.0	79.30	46.68	125,98
15	BEDFORD	1974	SRTC	147883	12.5	69.76	45.10	114.86
19.	BEDFORD	1974	KTC	154361	11.2	78.00	36.49	114.49
24	BEDFORD	1974	NWFP,GTS	143644	12.0	72.70	20.21	92.91
14	MOGURT	1975	SRTC	133772	15.0	58.10	42.55	100.65
17	MOGURT	1975	KTC	105555	13.6	64.10	40.30	104.40

CONCLUSIONS:

i) NWFP,GTS (96.08 paisas per mile cost of fuel and maintenance) has done better with Fiat, 1968 model bus than the PRTB (120.34 ps/mile).

ii) PRTB(123.50 Ps/mile in fuel and maintenance) has done better with Fiat, 1967 model bus than the SRTC(132.22 Ps/mile)

iii) PUTC(99.17 Ps/mile in fuel and maintenance) has done better with Isuzu, 1975 model bus than the PRTB(128.30 Ps/mile)

iv) BedFord, 1974 model bus is common in four of five agencies. Its performance has been best in the NWFP, GTS as shown in the Table 3-11:

Table 3-11: FUEL AND MAINTENANCE COSTS BEDFORD,74 IN FOUR AGENCIES

Bedford Model 74 operating with	Per Mile fuel and Maintenance costs,Paisas
NWFP,GTS	92.91
KTC	114.49
SRTC	114.86
PUTC	125.98

v) SRTC(100.65 paisas per mile in fuel and maintenance) has done better with Mogurt 1975 model bus than the KTC(104.40 Paisas per mile)...

Table 3-12

PERFORMANCE OF PUBLIC SECTOR ROAD TRANSPORT CORPORATIONS IN PAKISTAN

FIGURES ARE FOR ONE AVERAGE BUS IN FLEET

S. No.	Agency	Size of the sample (No of Buses)	Average Monthly Mileage	Average fuel consumption MPG	Average lubricating oil MPG	Monthly Expend on Battery Rs.	Monthly Expend on Tyres, Rs.	Monthly Expend on Maint/repairs Rs. ps/mile.	Fuel and Maint costs Ps/mile	Revenue earned Ps/mile
1	NWFP, GTS	44	3157	11.6	75.17	555	54	99	439 13.90	89.07	208
2	PRTB	48	2050	10.7	81.49	837	46	237	795 38.78	120.27	175
3	SRTC	34	2420	14.1	61.84	621	66	360	860 35.53	97.37	197
4	KTC	35	2382	12.1	72.06	809	98	393	781 33.54	105.60	173
5	PUTC	36	1960	12.0	72.66	502	61	313	752 38.36	111.02	231
6	Intercity Bus Corp. (NWFP, GTS PRTB, SRTC)	126	1933	11.8	73.89	466	42	150	470 24.31	98.20	202
7	Urban Bus Corps PUTC, KTC)	71	3239	12.0	72.66	157	102	480	1152 35.56	108.22	190
8	Public sector Rd Transport Corps in Pakistan (Intercity and urban)	197	2404	11.9	73.27	238	64	269	716 29.78	103.05	196

[illegible]

[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

14. PERFORMANCE OF VARIOUS PROVINCIAL AND URBAN PUBLIC ROAD TRANSPORT CORPORATIONS IN PAKISTAN.

There are three (PRTB, SRTC NWFP, GTS) intercity and two urban (KTC & PUTC) transport corporations in Pakistan. These corporations operate under more or less same conditions. However, better management and organisation of operations does make some difference in their working. Table 3-12 lists the various comparison parameters reduced to the operation of an 'Average bus' in each agency.

Out of the three intercity agencies, NWFP, GTS seems to be spending less on fuel and maintenance and earning more revenue as compared to SRTC and PRTB.

In the two Urban Transport Corporations, KTC spends less on fuel and maintenance than the PUTC but earns less revenue as compared to PUTC.

In general, an average bus in public sector in Pakistan costs about a rupee per mile in fuel and maintenance (exclusive of wages and overheads) and it earns a revenue of about two rupees per mile.

The performance of various public sector transport corporations as revealed by this study is just an 'indicator'. It should not be taken as 'factual' because the data on which this study is based has various inherent constraints and weaknesses and total reliance cannot be placed on the results of this study for performance of various public sector road transport agencies.

APPENDIX-I.

NATIONAL TRANSPORT RESEARCH CENTRE

DATA FORM FOR EVALUATING BUS RUNNING COST

DATE : - 1977 PLACE: LAHORE/KARACHI/PESHAWAR

RTC: PUNJAB/SIND/NWFP
UTC: LAHORE/KARACHI/PESHAWAR

BUS NO: Route:

1. BUS MAKE :
2. COUNTRY OF MANUFACTURE:
3. IMPORTED FROM ABROAD ☐
   PROCURED LOCALLY ☐
4. SINGLE DECKER ☐ SEATS ___
   DOUBLE DECKER ☐
5. PURCHASED AS
   CKD ☐
   CHASSIS ☐
6. BODY FABRICATION
   LOCAL ☐
   FOREIGN ☐
7. BODY FABRICATION MATERIAL
   IMPORTED ☐
   PROCURED LOCALLY ☐
8. MODEL 19 (YEAR)
9. ORDER PLACED 19
   PAID FOR 19
10. PUT ON ROAD 19
11. COST
    CKD _____
    CHASSIS _____
    BODY _____
    ORIGINAL _____
    SPARES _____
12. INSURANCE(MARINE) _____
13. FREIGHT _____
    LOCAL CURRENCY ☐
    FOREIGN EXCH. ☐
14. TOTAL CIF _____
15. AGENT'S COMMISSION _____
16. CLEARING CHARGES _____
17. CUSTOMS DUTY AND SALES TAX _____
18. OCTORI CHARGES _____
19. TOTAL CAPITAL COST OF BUS _____
20. COST OF CAPITAL,% (INTEREST ON LOAN) _____
21. ECONOMIC LIFE OF BUS, YEARS _____
22. SALVAGE VALUE _____
23. MILEAGE
    DAILY(24 HOURS) _____
    MONTHLY _____
    ANNUAL _____
    LIFETIME(ESTIMATED) _____
24. ENGINE
    WATER COLLED ☐
    AIR COOLED ☐
    DIESEL ☐
    PETROL ☐
25. DRIVE
    RIGHT HAND ☐ LEFT HAND ☐
26. FUEL CONSUMPTION
27. MILES TO IMPERIAL GALLON ___
    KMS TO LITRE _____

28. FUEL TANK CAPACITY

IMP. GALLONS____

LITRES ____

29. NO. OF TYRES ____

30. SIZE OF TYRES____

31. CHASSIS TYRE____

32. BATTERY

VOLTS ____

AMP. HOURS ____

EXPECTED LIFE

33. MANEUVERABILITY

(IN HILLS)____

34. YEARS ON ROAD ____

35. FURTHER USEFUL

ECONOMIC LIFE(EST)

36. HOURS ON ROAD

(IN 24 HOURS ____

37. ROUTE MILEAGE(INTERCITY)

ROUND TRIP MILEAGE(URBAN)

38. TIME OF ONE-WAY INTERCITY TRIP HOURS ____

TIME OF ROUND TRIP (URBAN) HOURS____ MIN____

39. ONE WAY INTERCITY TRIPS IN 24 HOURS____

ROUND TRIPS IN 24 HOURS (URBAN)____

40. DAYS OFF ROAD FOR ROUTINE MAINT.

____ DAYS EVERY FORTNIGHT

____ DAYS EVERY MONTH

41. DAYS OFF ROAD FOR MAJOR REPAIRS/ENGINE OVERHAUL/ ACCIDENT/IMPOUNDED

____ DAYS ANNUALLY

____ DAYS EVERY

____ YEARS

42. ROAD TAX(TOKEN), YEARLY____

43. OTHER TAXES, YEARLY ____

44. COST OF VEHICLES INSURANCE YEARLY ____

45. ANY OTHER INCIDENTALS, YEARLY____

46. DAMAGES PAID TO PASSENGERS IN CASE OF ACCIDENT ____

47. ROUTE MILEAGE, ONE WAY____

BOTH WAYS____

48. NO. OF STAFF SHIFTS OVER 24 HOURS

DRIVER ____

CONDUCTOR____

CHECKER ____

49. PASSENGERS CARRIED

FULLY LOADED(AS NO OF SEATS)____

OVER LOADED ____

UNDER LOADED ____

AVER. PASSENGERS CARRIED

____

50. FREIGHT CARRIED, MAUNDS

____

51. PRICE OF TICKETS

FOR FULL JOURNEY(MAX)____

FOR PART JOURNEY(MIN)____

____

____

52. FREIGHT CHARGES PER MAUNDS PER MILE ____

53. AVERAGE PASSENGER MILES PER TRIP ____

54. SEAT MILES PER TRIP

____

55. AVERAGE OPERATING SPEED, MPH.

56. FUEL INTAKE Gals.
(24 HOURS)
DIESEL ____
PETROL ____

57. ENGINE
(EVERY ____ DAYS
Gals. Qrts.
____ ____

MAINTENANCE

58. EVERY 24 HOURS
WASHING AND
CLEARING, RS. ____

59. EVERY ____ DAYS ____

60. EVERY ____ MONTH/S ____

61. EVERY YEAR (ANNUAL)

WORKSHOP CHARGES ____
SPARES FROM STORE ____
SPARES LOCAL PURCHASE ____
SPARES IMPORTED ____
ANY OTHER EXPENSE ____

SUB.TOTAL(ITEM 61) ____

62. ENGINE OVERHAUL EVERY ____
YEARS ____

63. MAJOR REPAIRS EVERY ____
YEARS ____

64. ACCIDENT REPAIRS DONE/EXPECTED
DURING BUS LIFE TIME ____

65. TOTAL ANNUAL MAINTENANCE
COSTS(ITEMS 58+59+60+61+62+63+64) ____

66. MAINTENANCE COST TRENDS

YEAR	COST	INCREASE
19		
19		
19		

67. PERIODICAL REPLACEMENT COSTS

EVERY ____ YEAR		COST
TYRES		
TUBES		
BATTERY		
ANYOTHER COMPONENT/PART		

68.

69.

70.

PERFORMANCE

	YES	NO
71. SUITS FOR OPERATING CONDITIONS IN PAKISTAN	☐	☐
72. IS ROBUST AND CAN TAKE HEAVY DUTY AND BAD ROAD CONDITIONS	☐	☐
73. FREQUENT BREAKDOWNS	☐	☐
74. EXCESSIVE WEAR AND TEAR	☐	☐
75. HIGH ON FUEL	☐	☐
76. CAN PERFORM WELL IN HOT CLIMATE	☐	☐

APPENDIX-II.

NATIONAL TRANSPORT RESEARCH CENTRE

BUS MAKE STUDY

QUESTIONNAIRE

	FOR OFFICE USE
1. Serial No:	
2. Date of Survey:	
3. Agency:	
4. Bus Number:	
5. Bus Make	
6. Model (Year)	
7. Status: ON ROAD/OFFROAD (1) (2)	
8. Date put on Road:	
9. Route: Inter City/Urban (1) (2)	
10. Capacity: (a) Total: (b) Seats: (c) Standing:	
11. Capital Cost:	
12. Life:	
13. Rate of Interest(percent)-12	

APPENDIX-II

(Continued-1).

INPUT

BUS NO :

Month & Year	Miles	Revenue for the Month Rs.	FUEL		Lubricants		EXPENDITURE, Rs			Revenue Earned, Rs.
			Gallons	Price per Gallon Rs.	Gallons	Price per Gallon Rs.	Battery	Tyres	Repair/ Mainten-ance	
14	15	16	17	18	19	20	21	22	23	24

Table 2-1 [illegible]

Model Group No.	Model/Agency/Status	Months on Road	Cumulative	Mon	Max	Month	Min	AVG/Month	12 Months	24 Months	36 Months	48 Months
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	BLMC,74/PRTB ONROAD	40	100373	2	7202	20	0	2509	42251	76134	97297	100373(40)
2.	BLMC, 74/PRTB OFFROAD	43	100045	9	3785	43	210	2326	35194	69122	93028	100045(43)
3.	FIAT,68/PRTB OFFROAD	47	129626	3	5260	22	0	2758	44228	83637	113451	129626(47)
4.	FIAT,67/PRTB OFFROAD	53	121323		5160	22	0	2289	37076	69026	97324	115173
5.	BEDFORD,73/PRTB OFFROAD	44	95639	16	6717		0	2173	35283	65586	87159	95639(44)
6.	ISUZU,75/PRTB ONROAD	47	129672	12	8891	46	0	4109	66367	108247	113451	129672(47)
7.	BLMC,73/PUTC ONROAD	49	116251		2957		0	1927	26843	51328	73442	115173
8.	BLMC,73/PUTC OFFROAD	53	94817	20	3142		0	1789	24717	50045	70776	86824
9.	BEDFORD,74/PUTC ONROAD	48	119280	12	3642	15	0	2485	34108	62529	93570	119280
10.	BEDFORD,74/PUTC OFFROAD	48	114161	1	3134	19	0	2378	33123	60755	89133	114161
11.	ISUZU,74/PUTC ONROAD	48	86824	21	7211		0	2936	44705	76894	70776	86824
12.	ISUZU,75/PUTC ONROAD	48	119294	7	7410	21	0	3666	53240	97501	93570	119294
13.	MOGURT,75/SRTC ONROAD	53	118193	9	5100		0	2212	38345	63330	80045	114161
14.	MOGURT,75/SRTC ONROAD	53	133772	8	8953		0	2524	38441	68578	99566	124679
15.	BEDFORD,74/SRTC ONROAD	54	147883	6	4998		0	2738	45095	81955	113831	140169
16.	FIAT,67/SRTC OFFROAD	70	165593	59	5280		0	2365	44243	78645	108835	136317
17.	MOGURT,75/KTC ONROAD	53	105555	6	7778		0	2935	44678	75993	99566	97679
18.	MOGURT,75/KTC OFF ROAD	51	145636	9	7320		0	4792	66906	115013	113831	140169
19.	BEDFORD,74/KTC ON ROAD	60	154361	10	8120		0	2948	49362	87134	118725	142054
20.	BEDFORD,72/KTC OFF ROAD	60	163980	6	5062		0	2733	46383	84691	114617	143492
21.	FIAT,74/NWFP GTS ON ROAD	52	146264	11	7626		0	4452	53376	107665	159045	140169
22.	FIAT 68/NWFP GTS OFF ROAD	119	237276	5	6660		0	1993	49968	98733	133059	164354
23.	BEDFORD,75/NWFP GTS ONRD	60	164033	16	9090		0	2501	47167	70704	114617	143492
24.	BEDFORD,74 NWFP GTS ONRD	50	143644	8	7202		0	3057	58660	91570	117844	138747
25.	BEDFORD,69 NWFP GTS OFFRD	84	135426	6	9390		0	1612	28041	47287	66235	89102

Table 2-2 [illegible]

Model Group No.	Model	Month on Road	[illegible]	[illegible]	[illegible] Fuel Filter	[illegible]	[illegible] Oil Filter	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	[illegible]
1.	BLNC,74 OHDRLD	40	100979	10.6	40154	13.5	71131	9.7	97167	0.0	103797	[illegible]
[illegible]	BLNC,74 OTTRLAD	63	139545	10.0	35194	10.4	52100	10.1	03878	9.7	100045	[illegible]
[illegible]	FIAT,69 OTTRLAD	47	110635	17.7	46028	10.0	31150	9.0	113451	0.0	109072	[illegible]
[illegible]	FIAT, 67 OTTRLAD	53	111425	11.0	37076	11.5	65137	10.0	97324	9.7	115171	9.2
[illegible]	BLDFORD,73 OTTRLAD	46	50636	15.1	17293	12.0	67761	10.7	87159	8.0	93617	[illegible]
[illegible]	FIAT,70 ON ROAD	47	112179	10.0	65357	10.3	106147	9.2	105379	[illegible]		
[illegible]	FIAT,73 OTTRLAD	40	100351	11.0	36343	10.6	91305	9.7	73147	9.0	80597	9.7
[illegible]	[illegible], 72 OTTRLAD	51	91017	12.1	34717	11.9	51345	11.9	78778	10.2	86824	10.1
[illegible]	BLDFORD, 74 [illegible]	49	110287	11.0	34103	12.3	[illegible]	12.3	93577	9.5	[illegible]	9.0
[illegible]	[illegible], 74 [illegible]	40	[illegible]	12.0	37495	[illegible]	[illegible]	[illegible]	99130	10.0	[illegible]	[illegible]
9.	[illegible], 74 [illegible]	48	81821	12.0	41705	10.0	71161	10.5	70775	8.0	85521	[illegible]
10.	[illegible],75 [illegible]	38	[illegible]	12.1	33315	11.5	[illegible]	11.0	93571	9.7	[illegible]	9.0
11.	[illegible], 75 [illegible]	51	118283	10.1	53765	[illegible]	[illegible]	10.0	80554	[illegible]	[illegible]	[illegible]
12.	[illegible], 75 [illegible]	51	112770	10.0	38461	11.0	[illegible]	11.0	99366	[illegible]	[illegible]	10.0
13.	[illegible],74 OTTRLAD	54	147333	15.6	45005	15.7	61255	14.0	133531	10.0	150169	14.0
14.	FIAT 1,67 [illegible]	31	103533	11.5	64210	11.1	77145	11.7	110035	[illegible]	117317	10.3
15.	[illegible], 75 [illegible]	33	106275	11.0	43078	10.5	35777	10.6	97360	[illegible]	[illegible]	[illegible]
16.	[illegible], 75 [illegible]	51	145570	11.1	45906	12.0	118017	11.0	103831	8.4	140309	[illegible]
17.	BLDFORD, 74 [illegible]	63	191457	11.0	48362	13.7	57174	11.0	118725	10.1	140994	[illegible]
18.	BLDFORD,73 [illegible]	60	103993	11.3	46383	14.5	84591	12.0	114617	11.0	107691	[illegible]
19.	FIAT, 74 [illegible]	39	140344	11.4	53376	12.3	157365	11.7	109045	11.7	140159	11.1
20.	FIAT 69 [illegible]	119	237270	10.7	49968	12.5	98795	12.0	133059	12.1	164354	12.1
21.	BLDFORD, 75 [illegible]	60	154031	12.0	47107	10.6	75704	8.1	114617	12.0	140457	12.1
22.	BLDFORD, 74 [illegible]	50	103644	11.0	50653	11.0	95570	13.0	117844	11.0	146747	9.7
23.	BLDFORD, 69 [illegible]	84	135476	12.0	[illegible]	12.0	47287	12.0	66235	10.4	99152	12.1

Table 2-3 LUBRICATING OIL CONSUMED MILES/GAL

Model Group No.	Model	Months on Road	Cuml. Mileage	Av.Miles per Gal of Lub. oil	12 Month Mileage	Mile/Gal	24th Month Mileage	Miles/Gal	36th Mileage	Miles/Gal	48 th Mileace	Miles/Gal
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	BLMC,74 ONROAD	40	100373	264	42251	282	76134	243	97297	272	100373	174(40)
2.	BLMC,74 OFFROAD	43	100045	254	35194	262	69122	257	93028	253	100045(43)	105(43)
3.	FIAT,68 OFFROAD	47	129626	315	44228	339	83637	340	113451	286	129672(47)	208(47)
4.	FIAT,67 OFFROAD	53	121323	363	37076	298	69826	270	97324	213	115173	260
5.	BEDFORD,74 OFFROAD	44	95639	268	2173	255	3018	292	2214	215	87159	229(44)
6.	ISUZU,75 ON ROAD	47	123279	448	66367	519	108247	435	123279	175(30)		
7.	BLMC,73 ON ROAD	49	116251	385	26843	121	51328	156	73442	170	90597	9070(47)
8.	BLMC,73 OFFROAD	53	94817	113	24717	127	50045	112	70776	101	86824	99
9.	BEDFORD,74 ON ROAD	48	119280	109	34108	122	62529	107	93570	98	119294	73
10.	BEDFORD,74 OFFROAD	48	114161	109	33123	107	60755	103	89133	112	114161	94
11.	ISUZU,74 ON ROAD	48	86824	117		124		109		213		260
12.	ISUZU,75 ON ROAD	48	112102	141	53240	154	97501	113	93570	215	112102	229
13.	MOGURT,74 ON ROAD	53	118193	137	38345	166	63330	137	80054	94	86291	83
14.	MOGURT,75 ON ROAD	53	133772	133	38441	204	68578	151	99566	97	124679	80
15.	BEDFORD,74 ON ROAD	54	147883	134	45095	166	81955	140	113831	123	140169	54
16.	FIAT,67 OFF ROAD	70	165593	128	44243	167	78645	150	108835	124	136317	109
17.	MOGURT,75 ON ROAD	53	105555	176	44678	192	75993	130	99566	112	124679	94
18.	MOGURT,75 OFFROAD	51	145636	320	66906	344	115013	172	113831	213	140169	260
19.	BEDFORD,74 ON ROAD	60	144487	138	49362	164	87134	129	118725	118	142094	96
20.	BEDFORD,72 OFFROAD	60	163980	139	49362	172	87134	142	118725	136	142094	111
21.	FIAT,74 ON ROAD	52	146264	407	53376	897	107665	114	159045	1424	140169	80
22.	FIAT,68 OFFROAD	119	237276	884	49968	632	98733	643	133059	599	164354	918
23.	BEDFORD,75 ON ROAD	60	164033	1006		1076		268		124		109
24.	BEDFORD,74 ON ROAD	50	143644	306		515		973		463		182
25.	BEDFORD,69 OFFROAD	84	135426	174	28041	457	47287	1205	66235	622	89102	351

Table 2-4 EXPENDITURE ON BATTERY

Model Group No.	Model	Month on Road	Cum Mileage	Av. Monthly	12 Months Miles	Rs.	24 Months Miles	Rs.	36 Months Miles	Rs.	48 Months Miles
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1.	BLMC,74 ON ROAD	40	100373	110	42251	956	76134	1610	97297	3064	100373(40)
2.	BLMC,74 OFFROAD	43	100045	89	35195	525	69122	1125	93028	2432	100045(43)
3.	FIAT,68 OFFROAD	47	129626	63	44228	0	83637	734	113451	1469	129672(47)
4.	FIAT,67 OFFROAD	53	121323	48	37076	169	69826	869	97324	1197	115173
5.	BEDFORD,73 OFFROAD	44	95639	78	35283	679	65586	1925	87159	2537	95639(44)
6.	ISUZU,75 ON ROAD	47	129672	112	66367	1246	108247	2679	113451	1469	129672(47)
7.	BLMC,73 ON ROAD	49	116251	67	26843	426	51328	1586	73442	1911	115173
8.	BLMC,73 OFFROAD	53	94817	75	24717	380	50045	1594	70776	2816	86824
9.	BEDFORD,74 ON ROAD	48	119280	66	34108	0	62529	940	93570	2065	119294
10.	BEDFORD,74 OFFROAD	48	114161	101	33123	1496	60755	3096	89133	3096	114161
11.	ISUZU,74 ON ROAD	48	86824	92	44705	228	78894	1778	70776	2816	86824
12.	ISUZU,75 ON ROAD	48	119294	78	53240	872	97501	2364	93570	2065	119294
13.	MOGURT,74 ON ROAD	53	118193	108	38345	1066	63330	2132	80054	3318	114161
14.	MOGURT,75 ON ROAD	53	133772	115	38441	640	68578	2392	99566	4072	124679
15.	BEDFORD,74 ON ROAD	54	147883	110	45095	865	81955	2428	113831	4209	140169
16.	FIAT,67 OFF ROAD	70	165593	53	44243	352	78645	897	108835	1687	136317
17.	MOGURT,75 ON ROAD	53	105555	106	44678	1199	75993	2737	99566	4072	124679
18.	MOGURT,75 OFFROAD	51	145636	106	66906	0	115013	2550	113831	4209	140169
19.	BEDFORD,74 ON ROAD	60	154361	119	49362	1266	8713	2933	118725	4632	142094
20.	BEDFORD,72 OFFROAD	60	163980	133	46383	851	84691	2066	114617	4448	143492
21.	FIAT,74 ON ROAD	52	146264	88	53376	277	107665	1501	159045	3351	140169
22.	FIAT, 68 OFFROAD	119	237276	23	49968	0	98733	107	133059	107	164354
23.	BEDFORD,75 ON ROAD	60	164033	76	47167	332	70704	1686	114617	448	143492
24.	BEDFORD,74 ON ROAD	50	143644	66	58660	161	91570	986	117844	2069	146747
25.	BEDFORD,69 OFFROAD	84	135426	28	28041	131	47287	438	66235	941	89102

Table 2-5 EXPENDITURE ON TYRES

Model Group No.	Model	Month on Road	Cum Mileage	Av. Monthly	12 Months Miles	Rs	24 Months Miles	Rs	36 Months Miles	Rs	48 Months Miles
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1.	BLMC,74 ONROAD	40	100373	327	42251	2501	76134	8694	97297	13092	100373(40)
2.	BLMC,74 OFFROAD	43	100045	387	35194	3618	69122	7140	93028	16651	100045(43)
3.	FIAT,68 OFFROAD	47	129626	237	44228	0	83637	4785	113451	11155	129672(47)
4.	FIAT,67 OFFROAD	53	121323	259	37076	980	69826	5515	97324	9052	115173
5.	BEDFORD,73 OFFROAD	44	95639	290	3018	2722	2214	8041	87159	0205	95639(44)
6.	ISUZU,75 ONROAD	47	129672	429	66367	4840	108247	12513	113451	11151	129672(47)
7.	BLMC,73 ONROAD	49	116251	395	26843	2711	51328	7795	73442	12517	115173
8.	BLMC,73 OFFROAD	53	94817	399	24717	1432	50045	7057	70776	12775	86824
9.	BEDFORD,74 ONROAD	48	119280	363	34108	882	62529	4438	93570	6765	119294
10.	BEDFORD,74 OFFROAD	48	114161	391	33123	0	60755	7968	89133	7968	114161
11.	ISUZU,74 ONROAD	48	86824	434	44705	1572	76343	7154	70776	12775	86824
12.	ISUZU,75 ON ROAD	48	119294	570	53240	4017	97501	10011	93570	6765	119296
13.	MOGURT,75 ONROAD	53	118193	522	38345	4432	63330	10378	80054	18673	114161
14.	MOGURT,75 ONROAD	53	133772	561	38441	3536	68578	12894	99566	20868	124679
15.	BEDFORD,74 ONROAD	54	147883	585	45095	3998	81955	[illegible]	113831	17503	140169
16.	FIAT,67 OFFROAD	70	165593	325	44243	2357	78645	[illegible]	108835	11234	136317
17.	MOGURT,75 ONROAD	53	105555	523	44678	4495	75993	[illegible]	99566	20868	124679
18.	MOGURT,75 OFFROAD	51	145636	352	66906	1330	115013	[illegible]	113831	17503	140169
19.	BEDFORD,74 ONROAD	60	154361	628	49362	4165	87134	[illegible]	118725	18616	142094
20.	BEDFORD,72 OFFROAD	60		426	46383	3443	84691	[illegible]	114617	12445	143492
21.	FIAT,74, [illegible]	52	146264	110	53376	1255	107665	[illegible]	159045	4078	140169
22.	FIAT,68 OFFROAD	119	237276	109	53376	[illegible]	98733	4548	133059	5780	164354
23.	BEDFORD,75 ONROAD	60	164033	62	47167	192	70704	1173	114617	12445	143492
24.	BEDFORD,74 ONROAD	50	143644	82	58660	530	91570	1558	117844	2991	146747
25.	BEDFORD,69 OFFROAD	84	135426	98	28041	823	47287	2604	66235	3243	[illegible]

Table 2-6 MAINT EXPENDITURE

Model Group No.	Model	Month on Road	Total Road Mileage	Av. Monthly Rs.	Mon	Maximum Monthly Mileage	Rs	Mon	Minimum Monthly Mileage	Rs	12 Months Mileage	Rs	24 Months Mileage	Rs	36 Months Mileage	Rs	48 Month Mileage
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
1.	BLMC,74 ONROAD	40	100373	1066	36	97297	3001	37	97573	122	42251	8630	76134	23057	97297	40275	100373
2.	BLMC,74 OFFROAD	43	100045	1236	31	83860	4521	41	99457	0	35194	8832	69122	23356	93028	45977	100045
3.	FIAT,68 OFFROAD	47	129626	936	20	73497	2286	46	129046	0	44228	9523	83637	21207	113451	31306	129672
4.	FIAT,67 OFFROAD	53	121323	847	50	118193	1375	53	121323	0	37076	7108	69826	16781	97324	28239	115173
5.	BEDFORD,73 OFFROAD	44	95639	1275	40	92153	2272	1	3128	112	35283	12507	65586	28525	87159	43534	95639
6.	ISUZU,75 ON ROAD	47	129672	1689	19	94850	4122	46	129046	0	66367	12537	108247	35010	113451	31306	129672
7.	BLMC,73 ON ROAD	49	116251	952	20	44154	1980	53	121323	0	26843	11179	51328	22207	73442	33863	115173
8.	BLMC,73 OFFROAD	53	94817	998	53	94817	2680	1	1850	98	24717	8880	50045	20549	70776	32604	86824
9.	BEDFORD,74 ON ROAD	48	119280	1160	46	115998	7589	47	117605	20	34108	9995	62529	20624	93570	35137	119294
10.	BEDFORD,74 OFFROAD	48	114161	742	34	83910	2100	13	35612	78	33123	8465	60755	15698	89133	24230	114161
11.	ISUZU,74 ON ROAD	48	86824	1027	32	96397	1888	48	86824	326	44705	10206	78894	22893	70776	32604	86824
12.	ISUZU,75 ON ROAD	48	119294	978	46	115998	7589	47	117605	20	53240	10079	97501	23679	93570	35137	119294
13.	MOGURT,74 ON ROAD	53	118193	792	31	70481	3088	53	121323	0	38345	5436	63330	16181	80054	27826	114161
14.	MOGURT,75 ON ROAD	53	133772	1074	48	124679	3200	1	3111	79	38441	6774	68578	19212	99566	33498	124679
15.	BEDFORD,74 ON ROAD	54	147883	1235	47	139841	3847	1	3356	100	45095	6502	81955	19255	113831	35253	140169
16.	FIAT,67 OFF ROAD	70	165593	1332	63	159372	3279	1	3014	42	44243	5708	78645	16809	108835	33524	136317
17.	MOGURT,75 ON ROAD	53	105555	1183	48	124679	3200	1	2844	206	44678	9697	75993	24557	99566	33498	124679
18.	MOGURT,75 OFFROAD	51	147883	887	49	141730	2754	12	66906	130	66906	9629	115013	21300	113831	35253	140169
19.	BEDFORD,74 ON ROAD	60	154361	1076	50	140536	2423	1	2825	86	49362	4791	87134	15405	118725	32419	142094
20.	BEDFORD,72 OFFROAD	60	163980	1041	54	158026	2889	1	3032	41	46383	6008	84691	16054	114617	27889	143492
21.	FIAT,74 ON ROAD	52	146264	621	47	139841	3847	2	6959	227	53376	3662	107665	10302	159045	19884	140169
22.	FIAT,68 OFFROAD	119	237276	225	85	219843	2428	119	237276	0	49968	0	98733	1449	133059	3044	164354
23.	BEDFORD,75 ON ROAD	60	164033	511	59	164004	3256	1	2694	20	47167	2494	70704	11092	114617	27889	143492
24.	BEDFORD,74 ON ROAD	50	143644	619	49	141730	2754	48	146747	0	58660	4084	91570	9697	117844	19574	146747
25.	BEDFORD,69 OFFROAD	84	135426	1612	23	46534	2596	84	135426	0	28041	1273	47287	7991	66235	14323	89102

Table 2-7 Revenue Earned Per Miles, Paisas

Model Group No.	Model/Status	Months on Road	Cuml. Mileage	Av. Monthly	Mon	Min		Max	12th month	24th	36th	48th month
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1.	BLMC,74 ONROAD	40	100373	45	36	21	37	289	23	24	21	195(40th)
2.	BLMC,74 OFFROAD	43	100045	148	25	71	43	439	129	86	246	439(43)
3.	FIAT,68 OFFROAD	47	129626	75	22	41	47	194	55	127	56	194(47)
4.	FIAT,67 OFFROAD	53	121323	24	24	4	51	88	12	4	13	51
5.	BEDFORD 73 OFFROAD	44	95639	24	5	0	42	83	14	11	16	281(44)
6.	ISUZU,75 ON ROAD	47	129672	44	12	9	24	76	9	76	110	
7.	BLMC,73 ON ROAD	49	116251	50	1	37	47	78	51	72	40	78
8.	BLMC,73 OFFROAD	53	94817	54	29	26	50	204	28	30	30	204
9.	BEDFORD,74 ONROAD	48	119280	98	8	51	45	267	74	79	80	217
10.	BEDFORD,74 OFFROAD	48	114161	219	47	120	10	279	163	212	192	181
11.	ISUZU,74 ONROAD	48	86824	12	11	0	53	185	15	18	13	51
12.	ISUZU,75 ONROAD	48	119294	38	8	9	44	281	32	44	16	281
13.	MOGURT,74 ONROAD	53	118193	88	9	42	37	153	130	94	99	145
14.	MOGURT,75 ONROAD	53	133772	121	8	27	36	426	40	46	426	355
15.	BEDFORD,74 ONROAD	54	147883	165	53	0	54	3187	15	17	50	475
16.	FIAT,67 OFFROAD	70	165593	27	16	10	70	182	10	13	16	17
17.	MOGURT,75 ONROAD	53	105555	12	10	9	41	274	10	15	192	181
18.	MOGURT, 75 OFFROAD	51	145636	113	35	11	17	188	107	146	13	51
19.	BEDFORD,74 ONROAD	60	154361	22	10	08	49	128	10	12	18	98
20.	BEDFORD,72 OFFROAD	60	163980	46	38	14	59	260	24	27	32	148
21.	FIAT,74 ONROAD	52	146264	02	36	0	43	360	04	05	0	355
22.	FIAT 68 OFFROAD	119	237276	19	119	0	98	41	18	18	18	19
23.	BEDFORD,75 ONROAD	60	164033	39	44	15	70	182	34	98	16	17
24.	BEDFORD,74 ONROAD	50	143644	37	9	25	48	97	29	36	42	97
25.	BEDFORD,69 OFFROAD	84	135426	63	1	27	79	180	36	37	42	43

TABLE 2-8 PERFORMANCE OF SAME MODEL IN VARIOUS AGENCIES

Model Group No.	Model/Agency	Month on Road	Cumulative Mileage	Av. Monthly Mileage	Av. MPG	Miles to a gal of lub.oil	Av. Monthly battery expend,Rs	Av.monthly expend on Tyres Rs.	Av.Monthly Maintance Expend Rs.	Av.Monthly Revenue earned, paisas per Mile
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
3	FIAT 68/PRTB	47	129626	2758	10.1	315	63	237	936	75
22	FIAT 68/NWFP, GTS	119	237276	1993	10.3	884	23	109	225	19
16	FIAT 67/SRTC	70	165593	2365	11.5	128	53	325	1332	27
4	FIAT 67/PRTB	53	121323	2289	10.1	363	48	259	847	24
6	ISUZU 75/PRTB	47	129672	4109	10.0	448	112	429	1689	44
12	ISUZU 75/PUTC	48	119294	3666	12.1	141	78	570	978	38
9	BF 74/PUTC	48	119280	2485	11.0	109	66	363	1160	98
15	BF 74/SRTC	54	147883	2738	13.6	134	110	585	1235	165
19	BF 74/KTC	60	154361	2948	11.2	138	119	628	1076	22
24	BF 74/NWFP, GTS	50	143644	3057	12.0	306	66	82	619	37
14	MOGURT 75/SRTC	53	133772	2524	15.0	133	115	561	1074	121
17	MOGURT 75/KTC	53	105555	2935	12.5	176	106	523	1183	12

APPENDIX III

Table 2-9 PERFORMANCE OF SAME MODEL IN 'OFF ROAD' AND IN 'ON ROAD' CONDITION

Model Group No.	Model/Agency	Month on Road	Cumulative Mileage	Av. Monthly Mileage	Av. MPG	Miles to a gal of lub.oil	Av. Monthly battery expend,Rs	Av.monthly expend on Tyres,Rs.	Av.Monthly Maintenance expend, Rs.	Av.Monthly Revenue earned, paisas per mile.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1	BLMC/74 ONROAD/PRTB	40	100373	2509	10.6	264	110	327	1066	45
2	BLMC/74 OFFROAD/PRTB	43	100045	2326	10.6	254	89	387	1236	148
7	BLMC/73 ONROAD/PUTC	49	116251	1927	11.3	385	67	395	952	50
8	BLMC/73 OFFROAD/PUTC	53	94817	1789	11.5	113	75	399	998	54
9	BF/74 ONROAD/PUTC	48	119280	2485	11.0	109	66	363	1160	98
10	BF/74 OFFROAD/PUTC	48	114161	2378	12.2	109	101	391	742	219
17	MOGURT/75/ONROAD/KTC	53	105555	2935	12.5	176	106	523	1183	12
18	MOGURT/75/OFFROAD/KTC	51	145636	4792	11.1	320	106	352	887	113

Table 2-10 PERFORMANCE OF VARIOUS MODELS IN THE SAME AGENCY(PRTB)

Model Group No.	Make/Model/Status	Month on Road	Cumulative Mileage	Averace monthly	Av. MPG	Miles to a gal of lub. oil	Av. monthly battery Expend. Rs.	Ps/mile	Av. monthly expend on Tyres. Rs.	Ps/mile	Av. monthly maintenance expend. Rs.	Ps/mile	Total 8+9+10	Av. monthly Revenue ear Ps/mile
1.	2.	3.	4.	5.	6.	7.	8.		9.		10.		11.	12.
1.	BLMC,74 ON ROAD	40	100373	2509	10.6	204	110	4.38	327	13.03	1066	42.49	1503	45
2.	BLMC,74 OFFROAD	43	100045	2326	10.6	254	89	3.83	387	16.64	1236	53.14	1712	148
3.	FIAT,68 OFFROAD	47	129626	2758	10.1	315	63	2.28	237	8.59	936	33.94	1236	75
4.	FIAT,67 OFFROAD	53	121323	2289	10.1	363	48	2.10	259	11.31	847	37.00	1154	24
5.	BEDFORD,73 OFFROAD	44	95639	2173	10.2	268	78	3.59	290	13.35	1275	58.58	1643	24
6.	ISUZU, 75 ON ROAD	47	129672	4109	10.0	448	112	2.73	429	10.44	1689	41.10	2230	44

Table 2-11 : PERFORMANCE OF VARIOUS MODELS IN THE SAME AGENCY(PUTC)

Model Group No.	Make/Model/Status	Month on Road	Cumulative Mileage	Average monthly	Av. MPG	Miles to a gal of lub.oil.	Average monthly battery Expend. Rs.	Ps/mile	Av. monthly expend on tyres. Rs.	Ps/mile	Av. monthly maintenance Expend. Rs.	Ps/mile	Total,Rs 8+9+10	Av. monthly Revenue earned, Ps/mile.
1.	2.	3.	4.	5.	6.	7.	8.		9.		10.		11.	12.
7.	BLMC,73 ON ROAD	49	116251	1927	11.3	386	67	3.48	395	20.50	952	49.40	1414	50
8.	BLMC,73 OFFROAD	53	94817	1789	11.5	113	75	4.19	399	22.30	998	55.78	1472	54
9.	BEDFORD,74 ON ROAD	48	119280	2485	11.0	109	66	2.66	363	14.61	1160	46.68	1589	98
10.	BEDFORD,74 OFFROAD	48	114161	2378	12.2	109	101	4.25	391	16.44	742	31.20	1234	219
11.	ISUZU,74 ON ROAD	48	86824	2936	12.0	117	92	3.13	434	14.78	1027	34.98	1553	12
12.	ISUZU, 75 ON ROAD	48	119294	3666	12.1	141	78	2.13	570	15.54	978	26.67	1626	38

Table 2-12 PERFORMANCE OF VARIOUS MODELS IN THE SAME AGENCY(SRTC)

Model Group No.	Make/Model/Status	Month on Road	Cumulative Mileage.	Average monthly	Av. MPG	Miles to a gal of lub.oil	Average monthly battery Expend. Rs.	Ps/mile	Av. monthly expend on tyres. Rs.	Ps/mile	Av.monthly maintenance expend. Rs.	Ps/mile	Total,Rs 8+9+10	Av. monthly Revenue Earned, Ps/mile.
1.	2.	3.	4.	5.	6.	7.	8.		9.		10.		11.	12.
13.	MOGURT,75 ON ROAD	53	118193	2212	15.1	137	108	4.88	522	23.60	792	35.80	1422	88
14.	MOGURT,75 ON ROAD	53	133772	2524	15.0	133	115	4.56	561	22.22	1074	42.55	1750	121
15.	BEDFORD,74 ON ROAD	54	147883	2738	13.6	134	110	4.02	585	21.37	1235	45.10	1930	165
16.	FIAT,67 OFFROAD	70	165593	2365	11.5	128	53	2.24	325	13.74	1332	56.32	1710	27

Table 2-13 : PERFORMANCE OF VARIOUS MODELS IN THE SAME AGENCY(KTC)

Model Group No.	Make/Model/Status	Month on road	Cumulative Mileage.	Average monthly	Av. MPG	Miles to a gal of lub.oil	Av.monthly battery expend. Rs.	Ps/mile	Av. monthly expend on Tyres. Rs.	Ps/mile	Av. monthly maintenance expend. Rs.	Ps/mile	Total, Rs 8+9+10	Av. monthly Revenue earned Ps/mile
1.	2.	3.	4.	5.	6.	7.	8.		9.		10.		11.	12.
17.	MOGURT,75 ON ROAD	53	105555	2935	12.5	176	106	3.61	523	17.82	1183	40.30	1812	12
18.	MOGURT,75 OFFROAD	51	145636	4792	11.1	320	106	2.21	352	7.35	887	18.51	1345	113
19.	BEDFORD,74 ON ROAD	60	154361	2948	11.2	138	119	4.04	628	21.30	1076	36.49	1823	22
20.	BEDFORD,72 OFFROAD	60	163980	2733	11.2	139	133	4.87	426	15.58	1041	38.09	1600	46

Table 2-14: PERFORMANCE OF VARIOUS MODELS IN THE SAME AGENCY(NWFP,GTS)

Model Group No.	Make/Model/Status	Month on road	Cumulative Mileage	Average monthly	Av. MPG	Miles to a gal of lob.oil	Av.monthly battery expend. Rs.	Ps/mile	Av. monthly expend on Tyres. Rs.	Ps/mile	Av. monthly maintenance expend. Rs.	Ps/mile	Total,Rs 8+9+10	Av. monthly Revenue earned Ps/mile
1.	2.	3.	4.	5.	6.	7.	8.		9.		10.		11.	12.
21.	FIAT,74 ON ROAD	52	146264	4452	11.4	407	88	1.98	110	2.47	621	13.94	819	02
22.	FIAT,68 OFFROAD	119	237276	1993	10.3	884	23	1.15	109	5.47	225	11.28	357	19
23.	BEDFORD,75 ONROAD	60	164033	2501	12.2	1006	76	3.04	62	2.48	511	20.43	649	39
24.	BEDFORD,74 ONROAD	50	143644	3057	12.0	306	66	2.16	82	2.68	619	20.24	767	37
25.	BEDFORD,69 OFFROAD	84	135426	1612	12.0	174	28	1.74	98	6.08	1612	100.00	1738	63