

Consumer Preferences in Urban Buses and Bus Services, Part A - Main Report

Report

This Report presents the results of a consumer preference survey into bus design and bus service characteristics. The survey was conducted by the BTE together with the Metropolitan (Perth) Transport Trust, and consisted of two parts: household interviews carried out by the Australian Bureau of Statistics; and questionnaires distributed to travellers using the Perth suburban bus service.

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BUREAU OF TRANSPORT ECONOMICS

CONSUMER PREFERENCES
IN URBAN BUSES AND BUS SERVICES

Results of a Survey Conducted
in Perth in Conjunction with the
Metropolitan (Perth) Transport Trust
during August and September, 1974

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FOREWORD

Bus travel is an integral part of the public transport system of Australian cities. The preferences of the public regarding a bus system merit consideration when improvements to public transport are being considered.

This report presents the results of a consumer preference survey into bus design and bus service characteristics. The survey was conducted by the BTE together with the Metropolitan (Perth) Transport Trust, and consisted of two parts:

- (a) household interviews carried out by the Australian Bureau of Statistics
- (b) questionnaires distributed to travellers using the Perth suburban bus service.

The study was carried out by W.P. Egan of the Transport Engineering Branch, assisted by L.C. Lawlor and C.R. Sayers.

J.H.E. Taplin

Director

Bureau of Transport Economics
Canberra

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INTRODUCTION

The Bureau of Transport Economics is centrally involved in evaluations of improvements to urban public transport. As part of this involvement, the BTE has undertaken considerable research into both evaluation techniques and analytical methods associated with the urban public transport improvement evaluation program. At the same time, there has been a growing awareness of the fact that there are several aspects of public transport systems which are outside the scope of conventional evaluation procedures, but which are nevertheless of vital importance in determining the success of such systems. One particular aspect which the BTE has probed in some depth is the question of public reaction to urban public transport vehicle design.

In May/June 1973, the BTE conducted a survey⁽¹⁾ of householders in selected areas of Brisbane to determine their reaction to various options available to designers of rail carriages. The survey also included questions designed to determine the importance of various rail travel characteristics to people who normally travelled to work by train. Other parts of this survey probed respondents' travel patterns and their preferences for carriage colour schemes.

The Brisbane survey was largely experimental in character, and consequently was limited to workers living within 1.6 km (1 mile) of selected railway lines in the metropolitan area and covered over 1400 households. Despite the fact that this survey broke new ground, with survey procedures not completely refined, the results were of considerable significance. In particular, it was dramatically demonstrated that the public care greatly about rail carriage design, and particularly about factors affecting passenger comfort. In fact, comfort considerations were considered substantially more important than fare variations.

(1) Full results of this survey are presented in the BTE report: Consumer Preferences in Urban Rail Carriage Design, March 1974.

In view of the significance of the results of the Brisbane survey, the BTE then decided to undertake a similar study of public opinion about bus design and travel. With the very valuable co-operation and active assistance of the officers of the Metropolitan (Perth) Passenger Transport Trust, this study was carried out in Perth in August/September 1974. The study was conducted in Perth for several reasons:

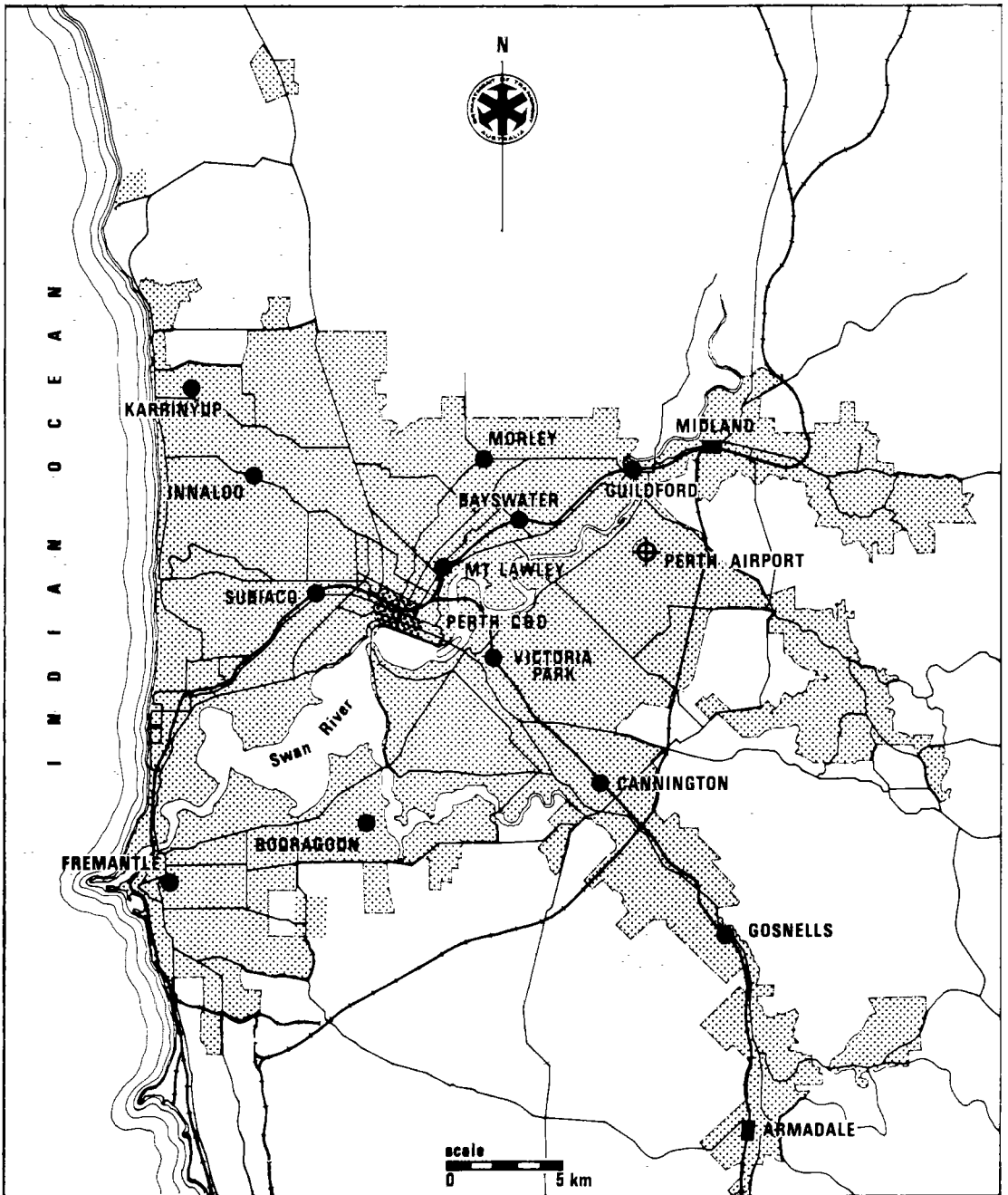
- . The Metropolitan (Perth) Transport Trust is heavily patronised, with an eighty five percent share of all urban public transport trips;
- . The MTT, because of its progressive acquisitions of private bus operations, has a comprehensive and varied range of bus models;
- . The MTT has adopted a program of service innovations and marketing strategies which has generated considerable public awareness of its operations.

The study was conducted in the urban areas of the Perth Statistical division (see Figure 1), and consisted of two distinct phases:

- . A survey of passengers on board buses to obtain their assessments of design features of the particular bus on which they were travelling.
- . A survey of householders in the Perth metropolitan area to assess their reactions to postulated design options.

The study in Perth was considerably more ambitious than that in Brisbane, but had similar general aims. The primary objective was to gauge public reaction to various features of bus design. Secondary objectives included assessment of the relative importance of various bus travel characteristics, together with a limited analysis of travel patterns.

In order to fulfil the objectives of the study, it was necessary to obtain information in the following manner. In the onboard survey phase of the study, preferences were derived from responses to questions in which the respondents



NOTE : Urban Areas are shown shaded

FIGURE 1
URBAN AREAS , PERTH STATISTICAL DIVISION

were asked to comment on aspects of the bus they were travelling in at the time and on the MTT service as it affected them personally. In the household survey phase, information was obtained through rating and ranking questions, which were analysed to determine their general attitudes to bus and bus service characteristics.

Attitudinal surveys are the usual technique employed to determine preferences in such matters as vehicle design. More reliable results could however be obtained at great expense if, say, prototype vehicles were constructed in such quantities as to permit valid behavioural assessments. The onboard survey falls into the category of a prototype survey with the options incorporated in the bus on which the respondent was sampled available for use as an analysis benchmark. The limitations of this approach is of course that only those options already incorporated can be assessed.

A further important point relating to the interpretation of the results of the household survey and to some extent the onboard survey is that they can only serve as indications of peoples' attitudes, not their behaviour.

A general description of the results of the study are presented in this report, together with a brief description of the sample and survey techniques.

The results are discussed by design option or service characteristic by category drawing upon the detailed results presented in Parts B and C. Because the overall result is presented the design option or bus characteristics discussed do not necessarily follow their sequence in the questionnaire.

Because of the quantity of data in its original form two companion volumes presenting the information in detailed form have also been prepared. These two volumes designated Part B and C describe separately the onboard and household survey respectively. In them the analysis of responses to design option rating and ranking has been detailed. Demographic and social details have been analysed

and compared with those of the entire Perth sample to check sampling validity. The demographic information has also been used in variation analysis of the rating and ranking questions. The trip making characteristics collected have not been considered in great detail since, with the exception of the onboard rating questions they do not bear greatly on the analyses of design options and system characteristics.

The presentation of detailed results for each survey in Parts B and C follows closely the questionnaire structure.

Parts B and C are issued as separate reports.

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- . Messrs Bates and Powell who distributed and collected questionnaires
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Australian Bureau of Statistics

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- . Field Survey Operations Branch, Perth.

Transport Costs and Information Branch, BTE

- . Mr P. Thomas

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Acknowledgement is also due to all those who assisted in the survey including the survey respondents.

CHAPTER A 1

DETAILS OF THE STUDY

SAMPLE CHARACTERISTICS

Perth is located at latitude $32^{\circ} 00'S$ and a longitude of $115^{\circ} 50'E$. At the 1971 Census, the area of the Perth Statistical Division was approximately 564,000 hectares and its population was 703,199.

The climate is temperate seaboard, with an annual mean temperature of $18.1^{\circ}C$ and annual mean minimum and maximum temperatures of $13.1^{\circ}C$ and $23.1^{\circ}C$ respectively. The annual mean rainfall is 883 mm.

The city and its environs are serviced by an extensive system of roads, bus services and railways along several well defined corridors. There are 1,345 km of bus routes on which 58,765,307 passengers were carried during the 1973-1974 fiscal year.

The 1,345 km service network has been developed to fulfil the Public Transport Plan for Perth: transfer stations have been established at suburban shopping centres for the purpose of consolidating passenger loads so that regular and frequent bus services can be provided between the transfer station and the central business district from which most routes radiate.

Fares have been rationalised to a transferable (bus/rail/ferry) flat fare system which in September 1974 was 15 cents for the first section and 30 cents for travel beyond the first section anywhere on rail or bus within a radius of 30 km of Perth.

The Trust operates a wide range of models in its fleet. All the bus models are single deck with either mid underfloor or rear mounted engines. The bus bodies have been locally built to the MTT's specifications. Features of these bodies (particularly in the newer models) are:

- . Large opening windows
- . Full roof ventilation systems
- . Wide opening doors (automatic rear door)
- . Pram racks on the rear of the buses and interior luggage racks
- . Forward facing seats (semicoach style on latest models).

SURVEY SAMPLE

For the onboard survey, patrons were sampled on regular MTT route services. Every patron entering the bus during a run (terminus to terminus) was handed a questionnaire and asked to complete it and either hand it back or return it by post on completion. Since two MTT employees distributed survey forms during both the peak and off-peak periods, the survey returns were predominantly biased towards off-peak passengers, most of whom were females. The numbers of each bus model on which patrons were sampled were approximately proportional to the numbers of the model in the fleet.

For the household survey 81 Census Collector Districts (CCD's) were chosen on a random basis from the 1,034 CCD's which comprise the Perth Statistical Divisions. Sufficient houses were then chosen, also at random, from each CCD to provide a possible total of 1,000 completed questionnaires. Dwellings were defined as being in scope if they could be categorised as a private dwelling which included co-operative boarding houses. The occupants were deemed in scope if they spent the night before the first approach by the survey collector in the dwelling and were fifteen years or older.

SURVEY AND SURVEY QUESTIONNAIRE

Onboard Survey

Patrons who received questionnaires were encouraged to complete and return it before they alighted from the bus. The distributor/collector was permitted to

assist the respondent; in providing assistance however, care was exercised not to introduce bias.

The onboard questionnaire consisted of a series of personal, trip making and rating questions. The personal questions provide a check on the sample composition e.g. the distribution of sex, marital status etc. The trip making questions, e.g. number of times a month the respondent travelled by bus, the trip purpose etc., have been used together with the personal information to perform variational analyses on the rating question results. The rating questions consisted of two series of design options by which the sampled 'bus' was rated and by which the respondent could rate the MTT Service as it affected them personally. The rating scale used was poor, fair and good.

Control was maintained for each sampled bus route by the use of a route form on which the first and last questionnaire numbers were recorded together with information about the bus and route. Some of this information also served as a basis for variational analyses of the rating question results.

Household Survey

Respondents to the household survey were asked questions, with the aid of flash cards and shuffle boards where appropriate, by experienced ABS (Australian Bureau of Statistics) interviewers. The questionnaire contained personal, trip making, ranking, rating and colour preference questions. The ranking questions in which respondents were asked to arrange sets of bus design features and service characteristics into order of importance, provide a basis of evaluating the significance of the rated options in both the onboard and household surveys. The household rating questions and in many respects the onboard rating questions comprise alternate methods of achieving the ranked feature or characteristic. Knowing the importance respondents place on the feature or characteristic enables the results of the rating questions to be looked at in correct perspective.

As in the onboard survey, the personal and trip making questions were used for variational analyses of the rating questions.

Management of survey data was maintained by the use of a household control form. This form was completed by the interviewer on his first approach to each household. Details were recorded of the sample identification number, household membership and interviewing dates.

RESPONSE

The results of the survey indicate that users and non-users alike hold strong opinions on the matters raised in the survey and have a keen interest in public transport in general. In the onboard phase 6,090 completed questionnaires were returned to give a response rate of 78 percent which is very high for this survey type. In the household phase 935 completed questionnaires were returned. Very few people refused to co-operate and most showed interest in the aims of the survey and concern for the importance of improving urban bus transportation.

CHAPTER A. 2

INTRODUCTION

The results presented in this part of the report are in a form suitable for those readers who do not wish to examine the results in detail. The detailed results of the onboard and household surveys are presented respectively in parts B and C. The concurrent discussion of both surveys below is arranged in the order of significance determined by the results of the two household survey ranking questions. For convenience each ranked option is discussed in relation to:

- . its ranking
- . The rating by MTT patrons on its incorporation or level in MTT buses or bus service
- . The preferred method of incorporation of the design option or service characteristic into buses or bus services.

While respondents in the household survey were asked to rank and rate questions on thier own personal preference, the results must tend to reflect the desires of the respondent in relation to firstly Perth and secondly to the MTT services and care in their interpretation must be exercised.

Tables A2.1 and A2.2 show the ranking for the characteristics presented in the first and second ranking question respectively.

TABLE A2.1 - BUS DESIGN CHARACTERISTIC RANKING (1ST QUESTION)

Characteristic	Rank Order
Seat availability	1
Travel comfort	2
Cleanliness	3
Quiet and smooth ride	4
Entry and exit	5
Light, etc. control	6
Pollution control	7
Time reduction	8
Fare reductions	9
Interior style	10
Colour scheme	11
Exterior style	12

TABLE A2.2 - BUS SERVICE AND TRAVEL CHARACTERISTIC RANKING
(2ND QUESTION)

Characteristic	Rank Order
Frequent service	1
Safety	2
Reliable service	3
Seat availability	4
Distance to stops	5
Shelters	6
Express buses	7
Fare reduction	8
Reduced vandalism, etc	9
Timetables	10

In both surveys a descriptive scale was used for the rating questions. A numerical equivalence was assigned to the descriptive values (without the respondents knowledge or as part of the processing) to simplify analysis. The scales are and their equivalent values are:

<u>Onboard Survey</u>		<u>Household Survey</u>	
<u>Rating</u>	<u>Value</u>	<u>Rating</u>	<u>Value</u>
Poor	1	Highly undesirable	1
Fair	2	Undesirable	2
Good	3	Slightly undesirable	3
		Uncertain or indifferent	4
		Slightly desirable	5
		Desirable	6
		Highly desirable	7

BUS DESIGN FEATURES (1st RANKING QUESTION)

Seat Availability - Rank Order 1

This is a very significant result. To be seated during bus journeys was considered as the most important bus design characteristic. This result was reinforced by the extremely high rating of seating arrangements that maximised the number of seats, compared to those that were designed for a high proportion of standees (rating extremes 6.10 to 2.90 on the 7 point scale). Patrons rated the MTT layouts favourably (2.44 on 3 point scale) with the newer body styles which embody the current MTT policy of providing as many forward facing seats as possible receiving the highest ratings. Males and younger respondents as a group were more critical of seating layouts i.e. giving a lower rating in both the onboard and household surveys rating questions.

Of the methods suggested to improve seat availability, increasing the number of buses during peak hours was preferred to providing more seats at the expense of standing room in buses. Both methods were rated more than 'desirable' on the 7 point scale. The 'More Seats and Less Standing Room' question was rated more favourably by women (large

proportion of off-peak users) and displayed a bimodal histogram of ratings. The 'More Buses During Peak Hour' question received similar ratings by both males and females.

Travel Comfort - Rank Order 2

The ranking of travel comfort second to seat availability is consistent because they are complementary in the sense that passengers are most comfortable when seated, and able to adequately cope with packages or shopping baskets or other luggage and being easily able to withstand changes in acceleration.

There were two related questions to be rated in the onboard survey; seating comfort and standing comfort. 'Seating Comfort' received an overall rating of 2.40 on the three point scale. Males rated the feature lower than females 2.30 to 2.46 respectively. The overall rating decreased through the day and as the loading increased 'Standing Comfort' received an overall rating of 1.77 i.e. below "fair". The older models received a higher rating which indicates that the MTT policy of improving seating comfort and providing more seats has been to the detriment of standing comfort.

In the household survey several seat types and hand grip designs were rated by respondents. Of the seats, the design incorporating contoured padding was favoured first, particularly by females; the contoured fibreglass/polypropylene design was rated with a bimodal distribution of uncertain rating; and an unpadded uncontoured design received an unfavourable rating. The three handgrip designs (for standees) all received relatively low ratings and all displayed bimodal rating histograms. Overhead straps were least favoured (indifferent rating of 4.00 on the 7 point scale). Vertical bars were rated next highest at 5.10 and handgrips incorporated into the back of seats preferred with an overall rating of 5.30. Females particularly favoured the latter two designs presumably because of their stature limitations.

The results of the interior layout questions as mentioned in the question on seat availability are also relevant to this question.

Cleanliness - Rank Order 3

Bus cleanliness, another aspect of bus travel related to comfort, was ranked third. It is significant that this aspect takes precedence over such factors as the quietness and smoothness of the ride and the control of temperature and light.

The cleanliness of MTT buses was rated by patrons in the onboard survey as above 'fair' with an overall rating of 2.38. The more recent models which incorporate features to facilitate cleaning and which appear to remain clean longer were rated higher than older models. Younger patrons tended to have more critical standards of cleanliness.

The household survey considered eight methods of achieving bus cleanliness. These are in order of rating:

- . Frequent cleaning of seats and interior panels
- . Provision of rubbish containers on buses
- . Use of stain proof materials
- . Regular inside painting
- . Frequent outside cleaning
- . Regular outside painting
- . Colours which do not show dirt
- . Rubbish collection between trips.

All the methods were rated above 'slightly desirable' (numerical rating of 5.00 on 7 point scale) with frequent cleaning of seats and interior panels rated highest between 'desirable' and 'highly desirable' with a rating of 6.50. 'Rubbish Collection Between Trips' and 'Colours Which Do Not Show Dirt' the two lowest rated methods display bimodality in the rating histograms, suggesting cost considerations in the first and the camouflage aspects of the second may have influenced the result.

Quiet and Smooth Ride - Rank Order 4

A quiet and smooth ride which is yet again another comfort aspect of bus travel was ranked fourth.

The ride smoothness and noise levels in MTT buses was considered by patrons to be 'fair' with ratings (3 point scale) of 2.68 and 2.10 respectively. The rating histogram was near normal for male respondents but skewed in a more favourable sense for females. The rear engined models in the MTT fleet i.e. HINO and PANTHER received appreciably higher ratings for these two features, with the HINO receiving a comparatively high rating (2.31) for noise level.

In the household survey nine methods of achieving a quiet and smooth ride were considered. The methods in order of rating value are:

- . Smooth starting and stopping
- . Good suspension and springing
- . Regular attention to rattles and squeaks
- . Quiet engine and gearbox
- . Non-slip seat materials
- . Safety padded seats
- . Sound proofed walls and floors
- . Firmly padded seats
- . Windows which cannot be opened.

The first four features were rated higher than 'desirable' (6.00 on 7 point scale) with 'Smooth Starting and Stopping' receiving a rating of 6.43. 'Windows Which Cannot Be Opened' was the only feature rated as unfavourable (2.66 rating), however both this option and the 'Firmly Padded Seats' option displayed bimodality in the rating histogram. Since smooth starting and stopping is easily effected and good suspensions and mechanical noise insulation and damping are relatively low cost capital items an improvement in public approval could easily be gained for this bus design characteristic.

Entry and Exit - Rank Order 5

'Ease of Entry and Exit' ranked fifth, is an important feature of bus design and it can directly deter patronage by elderly people and mothers with small children etc. The importance that all potential users place on this feature is signified by its rank order.

Patrons rated both ease of entry and ease of exit in existing MTT buses to be between 'good' and 'very good' with overall ratings of 2.57 and 2.47 respectively (3 point scale). The newer PANTHER and HINO bus models received the highest ratings. Unpredictably, female respondents rated the features lower than males. It is also significant to note that ease of exist was rated below that of entry when buses provided egress by two doors instead of one, suggesting that there is room for improvement of egress arrangements in the door and step design.

Four methods of facilitating ease of entry were rated by respondents in the household survey. These were in order of rating:

- . Easily operated doors
- . Low steps
- . Quick method of paying fare
- . Wide steps

All were highly favoured receiving ratings varied from 6.25 to 5.97 on a 7 point scale. That 'Easily Operated Doors' received the highest rating is a surprising result. While the survey was purely attitudinal, the service in Perth as in most other cities is a one man operation where the driver operates the front door where patrons enter. A factor which may have influenced the result is possible uneasiness with the automatically opening rear exit doors on MTT buses. The second highest rated method 'Low Steps', a factor most operators are aware of, is confirmed again as being important in the preferences of patrons.

Control of Light, Temperature and Ventilation - Rank Order 6

These environmental aspects of bus design are also related to patron comfort. It is interesting to note that they were ranked behind the quietness and smoothness of the ride and the cleanliness of the bus which, with the exception of ride smoothness, are related to the environmental aspects of comfort and not to physical comfort. High level lighting, temperature and ventilation were rated, (3 point scale), in the onboard survey, at 2.66, 2.39 and 2.37 respectively. In general, younger respondents and frequent users of the service were more critical of standards. The more recent MTT models rated higher than the older models particularly in the case of light level.

The eleven methods to improve the control of environmental aspects were rated in the household survey in the following order:

- . Insulation Against Heat and Cold
- . Opening Windows
- . Roof Ventilators
- . Good Artificial Lighting
- . Tinted Window Glass
- . Large Windows
- . Air Conditioning
- . Fans
- . Heating in Winter
- . Pull Down Blinds
- . Transparent Roof Panels

Ratings varied between 5.87 and 3.65 (7 point scale) indicating there was no strongly preferred method. 'Fans', 'Heating in Winter' and 'Pull Down Blinds' received a rating between 4 and 5 (indifferent or uncertain and slightly desirable), and 'Transparent Roof Panels' were rated unfavourable at 3.65. The relatively poor ratings received by the above four methods can be explained either by their impracticability or their unsuitability in the Perth climatic situation.

Amongst the options receiving more favourable ratings, 'Air Conditioning' was surprisingly rated last, this result, however, may be caused by bias against options not normally encountered. The MTT policy of having windows which open quite a large amount appears to be the correct approach in the Perth situation. This style of window of course would not necessarily meet with approval in cities with different climatic conditions. The MTT policy of controlling temperature through good insulation against heat and through ventilation appears to be the best market approach.

Pollution Control - Rank Order 7

The relative importance of this bus characteristic may be gauged by its ranking ahead of time and fare reductions.

The control of exhaust smoke and smell in existing MTT models, particularly the newer models, was rated in the onboard survey to be between 'fair' and 'good' with a mean overall rating of 2.37 on the three point scale used.

The control of pollution was not considered in the household survey.

Time Reduction - Rank Order 8

This item is not a bus design feature but rather a service characteristic. It was included together with 'Fare Reduction', which is in the same category, to determine their importance relative to design features and to provide a basis for cross reference between the ranking of the design features and the service characteristics.

'Door to Door Travel Speed' was included in the service characteristic section of the onboard survey and was rated overall as between 'fair' and 'good' at a rating of 2.39 on the three point scale. Captive users, heavy users and those sampled in peak hours rated the characteristic lower than infrequent users. Younger respondents, probably with a higher assumed value of time, also rated the characteristic below that of older patrons.

Four methods of reducing travel time were considered. They were in order of rating score:

- . Reliable Service (Buses on Time)
- . Frequent Bus Service
- . Close Route Spacing
- . Express Bus Service

The rating score varied between 6.54 and 5.79 with the first two options rated above 'desirable' and the second two above 'slightly desirable'. All these options were rated highest by respondents who were frequent bus users. It is interesting to note that a reliable service was rated ahead of a frequent service indicating that waiting time counts more than in-bus travel time.

Fare Reduction - Rank Order 9

Fare reductions were considered less important than all the comfort aspects of bus design previously discussed. In the analysis of ranking, however, this item had the greatest variation in rankings.

Patrons rating the MTT Service characteristics gave a high rating to the fare level. The overall value of 2.28, (between 'fair' and 'good'), included a 40 percent response for a 'good' rating. The most significant variation in rating was with the number of bus trips the respondent made. The heavy users of buses, probably the captive users, rated the characteristic less favourably than infrequent users. The rating also decreased with the respondents' age.

No methods of reducing fares were considered in the household survey, however, the relative ranking and the favourable rating to current MTT fare levels suggests that patrons may be prepared to pay higher fares for improvements in comfort.

Interior Style - Rank Order 10

'Interior Style' together with 'Colour Scheme' and 'Exterior Style' was ranked well behind the lower ranked

characteristics. The rankings display very little variation indicating that respondents as a whole are agreed in their evaluation of the relative importance of the characteristic. The ranking of interior style ahead of Colour scheme and exterior style is a logically predictable result.

The interior styling of MTT buses was rated highly with a mean overall rating of 2.28 on the 3 point scale. Females rated the styling significantly higher than males (2.52 to 2.32 respectively). Recent MTT models received higher ratings than the older models.

Interior styling options were not considered in the household survey.

The results of this type of question are of doubtful validity because of preconditioning.

Colour Scheme - Rank Order 11

This characteristic of bus design was ranked conclusively at second least important of all those ranked.

Patrons ranked the current MTT colour scheme the most favourable; this comprises for exterior (green and cream), interior (cream) and seats (green with some brown) at 2.43, 2.30 and 2.38 respectively on the 3 point scale. Females consistently rated the colours higher than males. Newer models rated higher than the older models despite having the same colour scheme. The newer design and appearance may have influenced the result.

In the household survey respondents were asked to select a preferred colour and shade for the outside and the inside of the bus and the seats. Overwhelmingly, respondents preferred the colour and shade of the existing MTT fleet; there was, however, a divided vote over green or brown for seats. This result strongly indicates preconditioning, and throws doubt on its validity. Other colours favoured were:

Outside of bus
yellow
blue

- . Inside of bus
 - white
 - green
 - blue
- . Seats
 - blue
 - black

Exterior Style - Rank Order 12

Exterior style was ranked last of all the features in this question.

Patron respondents in the onboard survey considered the exterior styling of the MTT bus models to be between fair and good (rated 2.40 on the 3 point scale). Female respondents rated the designs higher than males. The new models were also rated higher than the older models.

In the onboard survey respondents were also asked to rate three bus exteriors. An exterior very similar to the current MTT body design, was rated the highest (5.40 on the seven point scale). A design similar to one of the US Department of Transport Transbus designs was favoured next (5.00 rating), and a bus somewhat resembling a NSW Public Transport Commission Leopard least favoured at 4.70. While this aspect of bus design was not considered important, the low ratings received by the three designs indicates that some degrees of increased approval could be obtained through an alternative more pleasing design.

Summary

The results of the survey relating to the question of bus design features are summarised in the following figure and tables. Figure A2.1 gives a scaled diagrammatic representation of the ranking of features and their rank totals. Tables A2.3 and A2.4 give the rating of:

- . features incorporated in existing MTT buses by bus types
- . methods of achieving or improving design features listed in rank order for the onboard and household survey respectively.

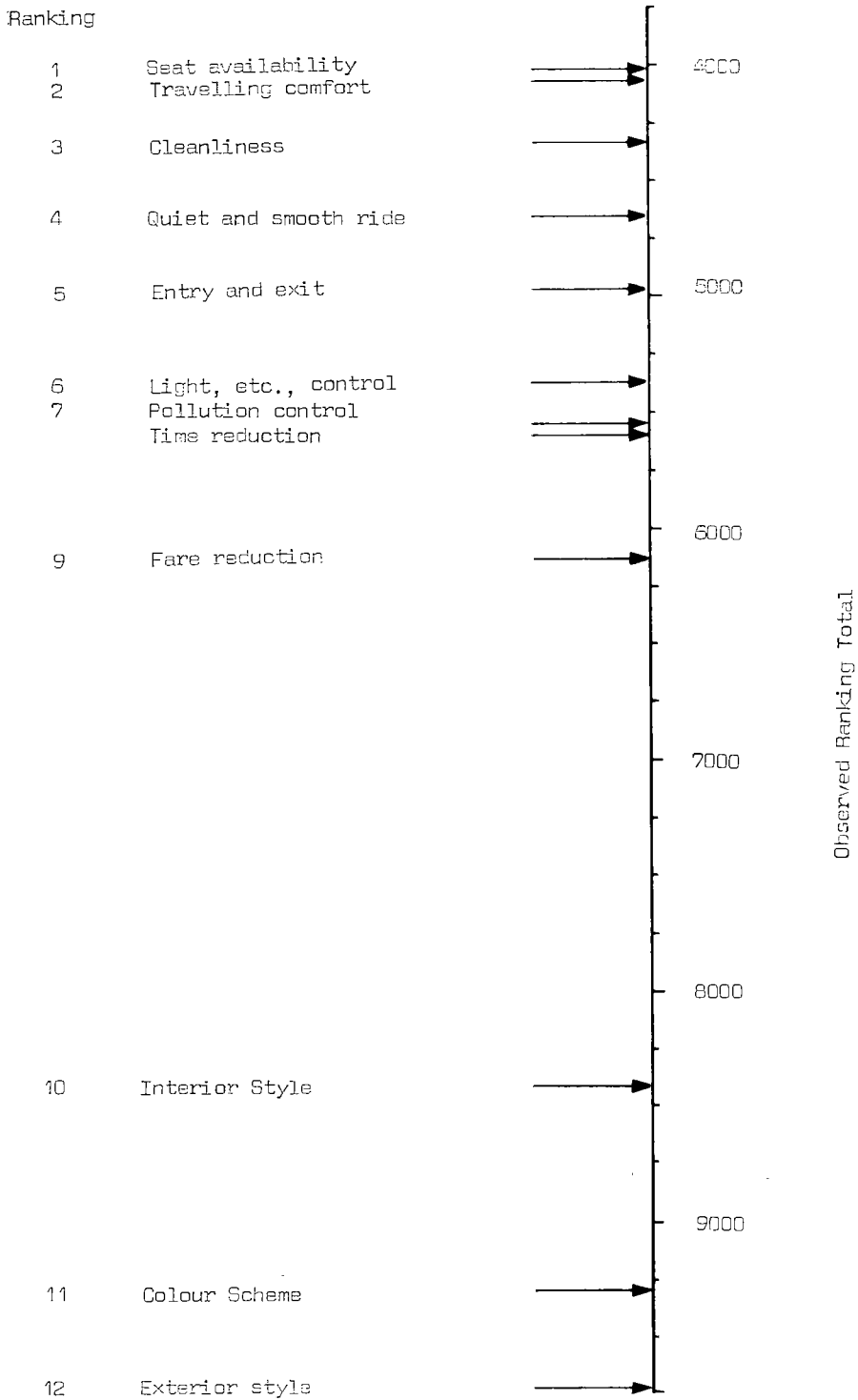


FIGURE A2.1
ORDER OF IMPORTANCE, 1ST RANKING QUESTION

TABLE A2.3 DESIGN FEATURE RATING BY BUS TYPE⁽¹⁾

DESIGN FEATURE	AEC MK VI	HINO	LEOPARD	PANTHER	TIGER CUB	WORLD-MASTER	OTHER	MEAN RATING	RANK ORDER
SEATING LAYOUT	2.327	2.626	2.476	2.553	2.436	2.324	2.220	2.443	1
STANDING COMFORT	1.707	1.930	1.727	1.874	1.762	1.643	1.606	1.767	2
SEATING COMFORT	2.259	2.647	2.395	2.582	2.409	2.222	2.182	2.414	2
BUS CLEANLINESS	2.212	2.454	2.351	2.498	2.456	2.312	2.206	2.377	3
NOISE LEVEL	2.063	2.311	1.900	2.107	1.023	2.004	1.971	2.078	4
RIDE SMOOTHNESS	1.947	2.385	2.016	2.232	2.080	1.924	1.878	2.099	4
EASE OF ENTRY	2.512	2.721	2.521	2.647	2.631	2.472	2.343	2.567	5
EASE OF EXIT	2.369	2.660	2.478	2.598	2.574	2.318	2.156	2.470	5
LIGHT LEVEL	2.649	2.735	2.674	2.714	2.700	2.640	2.477	2.662	6
TEMPERATURE	2.312	2.460	2.416	2.448	2.323	2.406	2.261	2.389	6
VENTILATION	2.261	2.506	2.447	2.493	2.271	2.326	2.130	2.368	6
CONTROL OF EXHAUST SMOKE AND SMELL	2.360	2.462	2.397	2.383	2.331	2.369	2.229	2.368	7
DOOR TO DOOR TRAVEL SPEED								2.391 ⁽²⁾ 2.280 ⁽²⁾	8
LEVEL OF FARES								2.278	10
INTERIOR STYLING	2.117	2.555	2.365	2.511	2.323	1.957	1.940	2.425	11
EXTERIOR COLOUR	2.428	2.511	2.459	2.444	2.459	2.346	2.316	2.302	11
INTERIOR COLOUR	2.215	2.491	2.424	2.459	2.338	2.048	2.065	2.383	11
SEAT COLOUR	2.261	2.611	2.496	2.541	2.427	2.108	2.134	2.399	12
EXTERIOR STYLING	2.367	2.586	2.476	2.540	2.498	2.157	2.114		
Mean rating	2.257	2.509	2.354	2.448	2.335	2.210	2.130	2.340	
Average Age of Bus model (yrs)	11	3	5	3	8	10	18		

(1) Mean Numerical Rating

Poor = 1, Fair = 2, Good = 3

(2) Not included in Total Mean Rating

TABLE A2.4 - RESPONSE TO DESIGN OPTIONS^(a)

Objective	Rank Order	Method	Rating Order	Mean Response
INCREASING SEAT CAPACITY	1	More Buses During Peak Hours	1	6.08
		More Seats and Less Standing Room	2	5.62
SEATING ARRANGEMENT	1 & 2	Interior Layout 1	1	6.14
		Interior Layout 2	2	5.22
		Interior Layout 3	3	2.95
SEAT DESIGN	2	Seat Design 1	1	6.12
		Seat Design 2	2	4.35
		Seat Design 3	3	3.33
SUPPORT FOR STANDING PASSENGERS	2	Handgrip Design 1	1	5.35
		Handgrip Design 3	2	5.13
		Handgrip Design 2	3	4.02
BUS CLEANLINESS	3	Frequent Cleaning of Seats and Interior Panels	1	6.46
		Provision of Rubbish Containers in Buses	2	6.26
		Use of Stain Proof Materials	3	6.02
		Regular Inside Painting	4	5.68
		Frequent Outside Cleaning	5	5.35
		Regular Outside Painting	6	5.24
		Colours which do not show dirt	7	5.16
		Rubbish Collection Between Trips	8	4.99
QUIET AND SMOOTH RIDE	4	Smooth Starting and Stopping	1	6.43
		Good Suspension and Springing	2	6.29
		Regular Attention to Rattles and Squeaks	3	6.24

(a) Details of layouts and designs mentioned below may be obtained in the accompanying reports, Parts A and B.

TABLE A2.4 - RESPONSE TO DESIGN OPTIONS^(a) (Cont'd)

Objective	Rank Order	Method	Rating Order	Mean Response
		Quiet Engine and Gearbox	4	6.12
		Non-slip Seat Materials	5	5.67
		Softly Padded Seats	6	5.49
		Sound Proofed Walls and Floors	7	5.34
		Firmly Padded Seats	8	4.65
		Windows which cannot be Opened	9	2.66
EASE OF ENTRY	5	Easily Operated Doors	1	6.25
		Low Steps	2	6.18
		Quick Method of Paying Fare	3	6.14
		Wide Steps	4	5.97
CONTROL OF LIGHT TEMPERATURE AND VENTILATION	6	Insulation Against Heat and Cold	1	5.87
		Opening Windows	2	5.79
		Roof Ventilators	3	5.65
		Good Artificial Lighting	4	5.58
		Tinted Window Glass	5	5.43
		Large Windows	6	5.25
		Air Conditioning	7	5.01
		Fans	8	4.99
		Heating in Winter	9	4.74
		Pull Down Blinds	10	4.38
		Transparent Roof Panels	11	3.65
REDUCTION IN TRAVEL TIME	8	Reliable Service (Buses on Time)	1	6.54
		Frequent Bus Service	2	6.30
		Close Route Spacing	3	5.84
		Express Bus Service	4	5.79
EXTERIOR DESIGN	12	Bus Design 1	1	5.44
		Bus Design 3	2	5.01
		Bus Design 2	3	4.73

BUS SERVICE CHARACTERISTICS (2nd RANKING QUESTION)

Frequent Service - Rank Order 1

Increasing the frequency of service is one means by which substantial improvements in door-to-door travel time can be effected. It is also known that waiting time, unavoidable in many instances when patrons are served by an infrequent service, counts heavily against the mode in modal choice decisions. This characteristic, together with 'Safety' and 'Reliability of Service', was ranked ahead of seat availability which was the highest ranking feature of bus design.

Patrons in the onboard survey rated the frequency of MTT services at only just above 'fair' (2.10 on the three point scale). Frequent users of the service and peak users (also usually frequent users) rated the service frequency higher than did infrequent and off-peak users. Another category of users, those who transferred to another mode for part of the sampled journey, were more critical of the characteristic.

Another somewhat related characteristic rated in the onboard survey was door-to-door travel speed which was rated higher overall at 2.39 but received lower ratings from the frequent and peak period users. The apparently anomalous trends of rating for these two characteristics by the frequent and peak period users may be explained by these respondents considering other components of the door-to-door journey such as access to and from the bus stop, transfers, and travel times to be more significant when making regular bus trips.

Several options aimed at reducing travel time were considered in the household survey; listed in order of rating, they are:

- . Reliable Service
- . Frequent Bus Service
- . Close Route Spacing
- . Express Bus Service

The ratings ranged from 6.54 to 5.79 on the seven point rating scale with a 'Frequent Bus Service' rated at 6.30 signifying strong approval for this option. For further comments see the previous section.

Safety - Rank Order 2

'Safety', ranked second highest, is obviously an important characteristic if patron satisfaction is to be maintained and improved. Safety is of course quite difficult to define and quantify.

MTT patrons rated 'Service Safety' very highly (2.67 on the three point scale), however, this decreased with increased usage by the respondent. No options were considered for rating in the household survey.

Although the questionnaires did not define the term adequately, it is apparent that the public expects a high degree of safety to be provided by the transport operator.

Reliable Service - Rank Order 3

This characteristic was ranked with almost the same rank total as the previous characteristic (safety), and well ahead of seat availability. The ranking of frequent service ahead of this characteristic reinforces an important but predictable result.

In the onboard survey patrons rated the reliability of the MTT service between fair and good with an overall rating of 2.37 on the three point scale. The rating decreased with the number of trips made by the respondent each month and by the bus loading at the time of sampling. Female patrons rated the characteristics significantly below male patrons (2.35 to 2.30).

'Reliable Service' was rated highest at 6.54 on the seven point scale in the household survey question on methods to reduce travel time.

Seat Availability - Rank Order 4

'Seat Availability' was the highest ranked feature/characteristic on the first ranking question, and its ranking in this question indicates that the preceding service characteristics are more important than all of the bus design features.

The onboard and household rating questions relating to seat availability have been discussed in the previous chapter.

Distance to Stops - Rank Order 5

It is surprising that this aspect of service was ranked so far behind frequency of service. However, respondents are reinforcing the previously stated notion that waiting time is more irksome than travel time and, in this case, access time. The ranking also indicates that MTT route spacing is generally satisfactory.

Patrons in the onboard survey rated the spacing of bus routes in the Perth Metropolitan area to be between "fair" and "good" with a rating of 2.29 on the three point scale. Frequent users and transferees tended to rate the characteristic more critically than off-peak users which is probably a reflection of the biased attitudes of the more non-captive patrons who use the service because of its convenience and proximity.

Options to improve this characteristic were not considered in the household survey. Respondents, however, did rate 'close route spacing' highly (5.83 on the seven point scale) as a method of reducing travel time.

Shelters - Rank Order 6

Shelters were ranked with a similar rank total to 'Distance From Stops', i.e. respondents place almost equal emphasis on the distance they have to travel to a bus stop as they do to finding a shelter at that stop.

MTT patrons rated the supply of shelters to be below 'fair' giving a rating of 1.87 (three point scale) to the feature. Male respondents rated the characteristic considerably higher than females (1.98 to 1.83 respectively). Peak users consistently rated the characteristic higher than off peak users (mainly females). The rating also increased with the number of trips made per month by the respondent. The rating increased with the respondents' age.

Two types of shelters were rated by respondents in the household survey. These resembled the two types currently used by the MTT. One shelter which resembled the precast concrete shelter used by the MTT was favoured receiving a rating of 5.63. The other shelter, which was similar to a pressed metal model used by the MTT where vandalism is not a great problem was less favoured, despite its modern appearance. The rating received was 4.34.

Express Buses - Rank Order 7.

It is not surprising that so many other facets of service were ranked ahead of this feature because of the off peak bias in the sample. Its low rank may be influenced by respondents who do not use a peak service and could not relate to the question. This feature and all the preceding features were ranked ahead of 'Fare Reduction'.

Respondents to the onboard survey rated the supply of express buses as only 'fair'. Peak travellers for whom express services are provided rated the service less favourably than off peak travellers. Frequent users also rated express service less favourably than infrequent users. This discrepancy could be caused by a lack of awareness of express services by off peak infrequent users.

For the reduction of travel time question in the household survey, 'Express Bus Services' was rated the lowest of the options at 5.79, which is between 'slightly desirable' and 'desirable' (5 and 6 on the seven point scale). Express bus services were not considered in the onboard survey.

Fare Reduction - Rank Order 8

Only two aspects of service, reduced vandalism etc., and timetables were considered less important than fare reductions. Once again, as for the bus feature ranking question, all the service characteristics ranked ahead of fare reductions could be improved with an associated increase in fares and meet with public approval.

The level of fares was rated between 'fair' and 'good' at 2.28 on the three point scale in the onboard survey. The rating decreased with the number of trips made by the respondent, i.e. regular users think fares too high, casual users think it is satisfactory, and as the respondents' age decreased.

Fare reduction was not considered in the household survey. Fare reduction was also discussed in the previous section.

Reduce Vandalism and Improve Passenger Security - Rank Order 9

Any ranking of this aspect of service is very much dependent on the prevailing social conditions and values. It is possible to explain the low ranking of this aspect by assuming that the standard of social behaviour in Perth and on MTT buses in particular is reasonably high.

The relatively high rating received for the two features, 'Control of Vandalism' and 'Passenger Security' in the onboard survey could be influenced by the lack of 'after dark' sampling. The ratings were 2.28 and 2.56 respectively, signifying approval. Surprisingly, the ratings improved with the respondents' age; however, they decreased with the number of trips made per month by the respondent.

Several options to reduce vandalism and improve security were considered in the household survey. They are in sequence of their rating:

- . Conductors on Bus
- . Radio Communication with Base

- . Checks by Uniformed Inspectors
- . Checks by Plain-Clothes Inspectors
- . Closed Circuit Television on Buses

The rating on the seven point scale ranged from 5.50 to 3.23, with the first three rated between 'slightly desirable' and 'desirable'; an indifferent response to 'Checks by Plain Clothes Inspectors' (4.59); 'Closed Circuit Television' was rated unfavourably at 3.23. Obviously conductors are not economically feasible to satisfy a preference on such a lowly ranked service feature. Radio communication may be a worth-while consideration.

Providing Timetable Information - Rank Order 10

'Providing Timetable Information' was ranked least important of the service features. Once again, this result may have been influenced by the excellent service offered by the MTT in this regard.

This feature was not rated in the onboard survey; however, several options were presented for this purpose in the household survey. The options in order of rating were:

- . Easily Remembered Time Tables
- . Timetables at Bus Stops
- . Timetables Supplied by Drivers
- . Timetables on Buses

All the options were rated between 'slightly desirable' and 'desirable' (5.85 to 5.34 on the seven point scale)

Summary

The results of the surveys relating to the question of bus service characteristics are summarised in the following figure and tables. Figure A2.2 gives a scaled diagrammatic representation of the ranking features and their rank totals. Tables A2.5 and A2.6 give the ratings of:

- . Characteristics of the MTT service
- . Methods of achieving or improving service characteristics

listed in rank order for the onboard and household survey respectively.

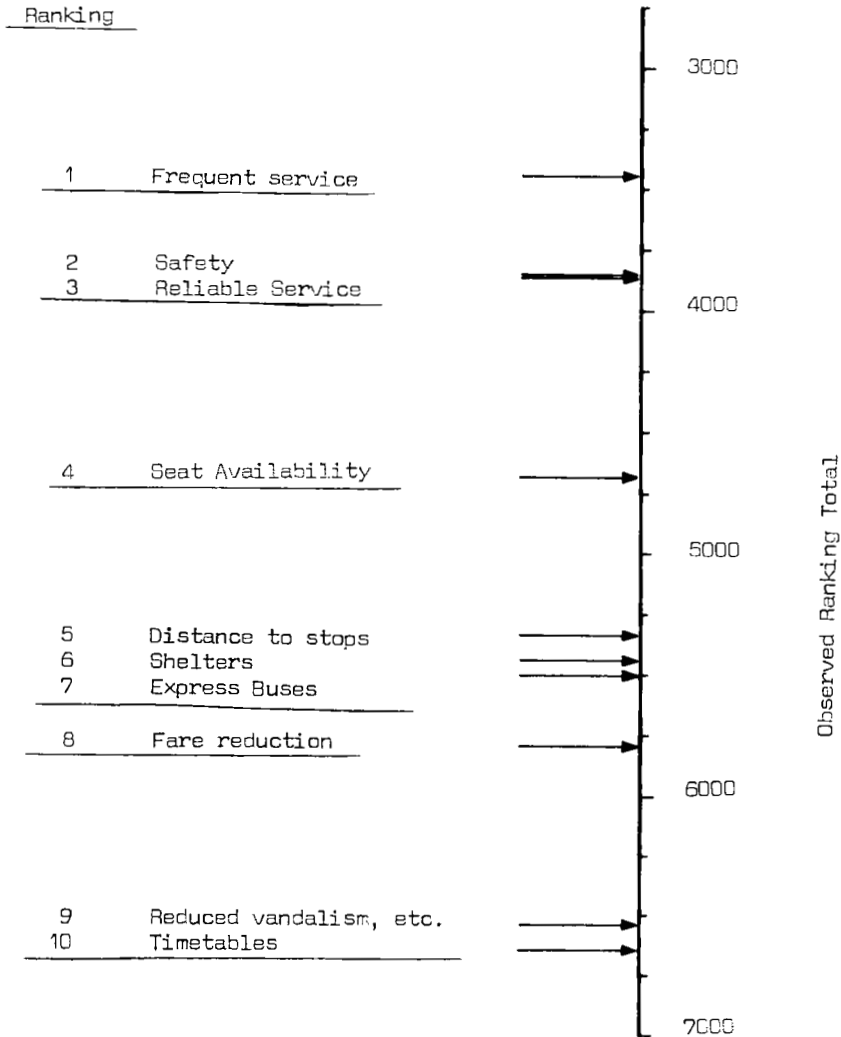


FIGURE A2.2
ORDER OF IMPORTANCE, 2ND RANKING QUESTION

TABLE A2.5 - SERVICE FEATURE RATING BY TRIPS PER MONTH

Service Feature	01-10	11-20	21-30	31-40	41-50	Over 50	Unstated	Mean Rating	Rank Order
Door-to-Door Travel Speed	2.480	2.451	2.414	2.268	2.305	2.278	2.469	2.391	1
Bus Frequency	2.149	2.130	2.107	2.046	2.018	1.926	2.260	2.102	1
Safety	2.744	2.701	2.686	2.604	2.602	2.618	2.688	2.673	2
Reliability (Buses on Time)	2.491	2.408	2.394	2.250	2.235	2.234	2.425	2.367	3
Seat Availability ⁽²⁾									
Spacing of Bus Routes	2.919	2.342	2.262	2.236	2.257	2.194	2.340	2.285	5
Supply of Bus Shelters	1.947	1.859	1.877	1.794	1.736	1.796	2.015	1.871	6
Number of Express Buses	2.049	2.070	2.020	1.946	1.930	2.204	2.164	2.028	7
Level of Fares	2.352	2.340	2.236	2.254	2.154	2.201	2.310	2.280	8
Control of Vandalism	2.372	2.325	2.258	2.197	2.204	2.185	2.343	2.279	9
Passenger Security	2.639	2.628	2.535	2.491	2.483	2.497	2.580	2.562	9
Overall Mean	2.464	2.325	2.279	2.209	2.211	2.213	2.359	2.284	

(1) Mean Numerical Rating Poor = 1, Fair = 2, Good = 3

(2) Not in questionnaire and not included in Total Mean Rating

TABLE A2.6 - RESPONSE TO SERVICE CHARACTERISTICS OPTIONS

Objective	Rank Order	Method	Order	Mean Response
REDUCTION IN TRAVEL TIME	1	Reliable Service (Buses on time)	1	6.54
		Frequent Bus Service	2	6.30
		Close Route Spacing	3	5.84
		Express Bus Service	4	5.79
INCREASING SEAT	4	More buses during peak hours	1	6.08
		More seats and less standing room	2	5.62
SEATING ARRANGEMENT	4	Interior Layout 1	1	6.14
		Interior Layout 2	2	5.22
		Interior Layout 3	3	2.95
SHELTER DESIGN	6	Shelter Design 2	1	5.63
		Shelter Design 1	2	4.34
REDUCE VANDALISM AND IMPROVE SECURITY		Conductors on Bus	1	5.50
		Radio Communication with Base	2	5.47
		Checks by Uniformed Inspectors	3	5.46
		Checks by Plain- Clothes Inspectors	4	4.59
		Closed Circuit Television on Buses	5	3.23
PROVIDING TIMETABLE INFORMATION		Easily Remembered Timetables	1	5.85
		Timetables at Bus Stops	2	5.78
		Timetables Supplied by Drivers	3	5.69
		Timetables on Buses	4	5.34

SUMMARY

As for the Brisbane survey the respondents were strongly in favour of options which improve travel comfort and trip convenience; concern for fare reduction was considered much less important.

All but two aspects of the MTT Service were rated above 'fair' in the onboard survey. Of the two options, 'Supply of Bus Shelters' and 'Standing Comfort', the latter would be of no great concern to the MTT as it is their policy to eliminate standing from bus travel in Perth. The highest rating features of the MTT buses were:

- . Light level
- . Ease of entering and exit
- . Seating layout
- . Exterior colour
- . Seating comfort

The highest rating MTT service characteristics were:

- . Safety
- . Passenger security
- . Door-to-door travel speed
- . Reliability
- . Spacing of bus routes

The important service characteristics which met with relatively low approval overall despite the high relative rating as a service characteristic, and the efforts of the MTT to provide one of the best services in Australia were:

- . Door-to-door travel speed
- . Reliability
- . Spacing of bus routes
- . Number of express buses

Features of bus design and service characteristics ranked as important in the household survey were:

- . Frequent service
- . Safety
- . Reliable service

- . Seat availability
- . Travel comfort

Options eliciting particularly favourable responses in the rating questions were:

- . Reliable bus services
- . Frequent bus services
- . Frequent cleaning of seats and interior panels
- . Smooth stopping and starting
- . Good suspension and springing

Conversely, features which were regarded as unfavourable included:

- . Windows which cannot be opened
- . Provision of standing room at the expense of forward seating capacity
- . Transparent roof panels
- . Uncontoured, hard seats
- . Closed circuit television as an anti-vandalism measure

In general, the Brisbane and Perth surveys appear to have a number of important messages for public transport designers, planners and operators. Although the results of these surveys are subject to various restrictions (not the least of which is their applicability to other cities), they do give some clear pointers to public preferences. In a serious attempt to win patronage from the private car, such pointers (particularly those relating to comfort) may be of great value indeed.