pared purist and pragmatic approaches to pricing decisions, while Forsyth and Hocking[14] examined the effects of load factor, service quality and delay factors on airline pricing policies, leading to a conclusion that pure competition is inadequate for setting frequencies and fares as the optimal fare is likely to be below cost.

A significant series of reports were made in the freight transport session. Perhaps the most impressive was the container shipping analysis of Gallagher[15], which laid out a lucid basis for discussion of Fremantle as a conference line terminal through a maze of options and uncertain cost structures. Zerby and Conlon[16] complemented Gallagher's servicing analysis with a unique analysis of the various commodity rates charged by the Australian terminating Shipping Conferences and the influence of cost and non-cost factors on these charges. The two papers should be read in conjunction with O'Reagan's[17] address to the ATRF dinner, as Acting Chairman of the Overseas Shipping Representatives Association and Managing Director of ACT (Australia), to complete a fascinating tripartite perspective on the issues. Hicks and Hodgkin[18] reported on some of the general principles elucidated in the South-Western Australian Transport Study (SWATS), which was formally released on the day of the presentation of the paper. This massive study analysed joint policy options for road and rail movement of freight over the huge area of Western Australia, and explored several variations of relaxed or revised regulation of movement and price. The original approach stemmed from the New Zealand Transport Study published in 1976, but SWATS differs fundamentally from this forerunner.

All the sessions bar one were held in a single hall, with a Paper Fair with displays and author attendance to break the format. The application of Bradford Bus Study costing methods to Adelaide[19], the automation of Canberra's bus scheduling system[20], the reduction and identification of discrete markets for promotion of Urban Public Transport in Perth[21], and an investigation of multiple hiring alternatives for taxis[22] (not generally permitted in Australia) covered a common field. The systematic planning exercise now being implemented in Geelong[23] for bicycle usage attracted considerable attention, while the applied operational research aspect of the Forum was represented by Mills' analysis[24] of depot location.

The management of road capacity, and the evaluation of such management measures, drew the attention of a car-user pressure group with the argument that fuel consumption variations in the stop-start characteristics altered by transit priority lanes might be critical[25] in the case of the Victoria Road bus and car-pool route in Sydney: McKenzie and Richardson[26] reported the switching between car-pooling and bus passenger travel for the Spit Road bus and car-pool priority lane (also in Sydney), where bus patronage remained substantially stable while car-pool numbers rose substantially.

Urban clearways were examined by Hallam and Dimitric[27] as a transport policy with an extensive range of cost and benefit factors to inform a clearway introduction policy for Sydney.

Analytical methods were to the fore in land-use issues, but sat uneasily in the ATRF format. Jefferson *et al*[28] reported an elegant use of geometric programming to relax some of the constraints on land use models of the Lowry family for residential development. Young and Richardson[29] presented a series of perceptual maps of residential location preferences in Melbourne with detailed discussion of the surface fitting and smoothing algorithms involved. Taylor[30] applied intensive local interview and survey methods to a small residential area to assess through and local traffic demands, and indicated the results of applying a model to reproduce the patterns of flow. In view of the scant 4 per cent through traffic, these results are of considerable interest for local planning of street systems.

Long-distance passenger travel has not been well documented in Australia. Aplin and Hirsch[31] reported initial results from a Bureau of Transport Economics long-distance National Travel Survey ('long-distance' is over 60 km). The figures were preliminary and showed much travel below 60 km, but indicate the significance of the final results when they become available by early 1979. Air travel within Australia is strongly competitive with other modes for inter-city travel, and dominates them all for business journeys. The domestic aircraft routeing and scheduling pattern in Australia gives Kingsford-Smith airport in Sydney a pivotal position, and any congestion in Sydney consequently very swiftly affects the whole aircraft movement pattern. Substantial international carrier capacity on inter-line legs remains unused due to Australian regulations. Haddy and McAndrew[32] discuss various methods of adapting international and national flight patterns to improve the customer service levels constrained by current Sydney operations. The longest regular rail service in the Continent is the Sydney-to-Perth 'Indian Pacific' run: Russell and Walker[33] of Western Australian Railways compare the costings of this service by the Westrail Management Services Bureau with those of an earlier study by the Commonwealth Bureau of Transport Economics. This passenger service is well used, and the differences between the BTE 'national' conclusion that it was covering its incremental operating costs and the net costs to Westrail as one of the joint operators of the service are discussed on the basis of cost attribution and the changes possible to improve both the service and the cost structure.

The performance of the ATRF in meeting its objectives of servicing 'Real Solutions' in the past was reviewed by McKenna and Starrs[34] who concluded that the heavy weighting towards applied research was appropriate, but that 'a large number of papers presented applied research which was not implemented by decision-makers, mainly because the researchers did not take sufficient notice of political or institutional constraints. This may seem to be stressing a point which is obvious and trite, but the fact that a large number of ATRF researchers complained of it only after the results of their research had failed to be implemented points out that it is a lesson which is not easily learnt'. This conclusion is virtually identical to that drawn by Drake[35] in his analysis of 50 transport modelling projects in the U.S. and Europe: 'The usefulness of the study to the decision-maker is enhanced by clients and modellers:

(*1*) knowing what they are asking of each other;

(*2*) searching out qualified industry people on both sides;

(*3*) probing *beforehand* each others' backgrounds, values, objectives, goals, needs, and punishment and reward systems; and

(*4*) keeping it short, simple and specific.'

This common and pragmatic ground between the U.S., Europe and Australia will probably be further established at a joint Canadian, U.S. and Australian ATRF meeting mooted for Hawaii in about two years' time.

REFERENCES

References 1–34 form the proceedings of the 4th ATRF, and are available from the Office of the Director-General of Transport, 68 St George's Terrace, Perth, Western Australia, 6000.

[1] JOY, S. Real solutions for real transport problems.
[2] SAYERS, C. R. Optimisation in the transport sector: A much neglected objective.
[3] HUGUETT, J. W. E. and R. G. MCLEAN. Methodology in airport studies and the guidance to decision-makers.
[4] SWAN, T. A., W. G. JORDAN and B. DELLAR. How the operator applies the concepts of corporate planning in Westrail.
[5] SKINNER, R. C. and J. S. V. SYMONS. Outdoor recreation demand modelling.
[6] STARKIE, D. N. M. Is modal choice modelling becoming obsolete?
[7] MORRIS, J. M., P. L. DUMBLE and M. R. WIGAN. Accessibility indicators for transport planning.
[8] DICK, H. W. Small-scale urban public transport: Lessons from the Indonesian experience?
[9] ROCHFORT, P. Public responsibility for the private sector of transport.
[10] ROCHFORT, P. and R. L. KERMODE. Public responsibility for the private sector of public transport based on New South Wales experience.
[11] USHER, J. C. Possibilities for demand-responsive bus operation in outer suburbs.
[12] DOGWRA, G. E. and H. M. KOLSEN. Taxes and subsidies in transport: Some unsettled issues.
[13] STEEPER, N. J. Economic theory and pragmatism in transport pricing decisions.
[14] FORSYTH, P. J. and R. D. HOCKING. Optimal airline fares, service quality and congestion.
[15] GALLAGHER, F. D. A practical simulation and evaluation of container shipping options.
[16] ZERBY, J. A. and R. M. CONLON. A statistica analysis of some influences determining ocean tariff rates.
[17] O'REAGAN, A. Transport research and cargo liner operations.
[18] HICKS, S. K. and K. E. HODGKIN. Freight transport policy: Five myths.
[19] ATACK, M. J., P. D. KEAL and M. M. STARRS. The costing of bus services in Adelaide.
[20] DOBLE, P. G. and A. W. WARDROP. An approach to automating Canberra's public transport scheduling system.
[21] BETTISON, G. E., R. DONOVAN and K. K. WILDERMUTH. Estimating the potential for marketing urban public transport.
[22] MACLEAN, S. and L. SEGAL. Multiple-hire alternatives for Australian taxi-cabs.
[23] SCOTT, M. J. C., D. D. HURNALL and W. H. PATTISON. The Geelong Bikeplan: Practical planning for cyclists' real needs.
[24] MILLS, R. G. H. Depot location.
[25] COX, R. G. and B. STARLES. The consequences of an experimental solution to a transport problem: Priority lanes.
[26] MCKENZIE, H. P. and A. J. RICHARDSON. Mode and route changing associated with the Spit Road Transit Lane.
[27] HALLAM, C. and A. DIMITRIC. Extended clearways: The issues.
[28] JEFFERSON, T. R., P. WALSH, R. W. GUBBERD and C. H. SCOTT. Forecasting the effects of changes in the work-place locations on residential development and trip generation.
[29] YOUNG, W. and A. J. RICHARDSON. Residential preference: A perceptual view of Melbourne.
[30] TAYLOR, M. A. P. Traffic distribution in a residential cell: A case-study.
[31] APLIN, W. N. and N. A. HIRSCH. The National Travel Survey 1977–78: Some preliminary results.
[32] HADDY, B. R. and R. L. MCANDREW. Operational initiatives in air transport.
[33] RUSSELL, S. and E. J. WALKER. Inter-state rail passenger services: Analysis and resolution of problems.
[34] STARRS, M. M. and K. MCKENNA. The purity of transport research.
[35] DRAKE, J. W. *The Administration of Transport Modelling Projects*. Report UMTA-MA-06-0019-72-1, U.S. Department of Transport (Urban Mass Transportation Administration), Washington, D.C., 1972.

Conference report

Perth, Western Australia; May 24 to 26

4th Australian Transport Research Forum

A report by M. R. Wigan
Australian Road Research Board

Table I. Composition of attendance at Forum

Major area		Main divisions		Breakdown	
Government Bodies	82	State Bodies	66	Policy Bodies	29
		Federal	16	Railway construction and operational Bodies	17
				Road construction and operational Bodies	15
				Regulatory Bodies	13
				Planning Bodies	6
				Sea and Port Bodies	2
Academics	23	University	17	Miscellaneous Departments	8
		Technical	6	Economics	7
				Engineering	5
				Geography	3
Private operators	18	Road freight	8		
		Air	5		
		Sea	3		
		Road passenger	2		
Consultants	15				
Users/Producers	12				
User Pressure Groups	12	Taxi	4		
		Car	3		
		Bus	2		
		Road freight	2		
		Sea freight	1		
National Research Bodies	7				

The Fourth Australian Transport Research Forum consolidated the development of the first three, and set a tone for broad involvement which should ensure a productive future for the Forum as long as the local roots are not forgotten in foreign sallies with other Transport Research Forums. This year it was held in Perth under the sponsorship of the office of the Director-General of Transport, and although approximately 3000 km from the other States attracted a substantial audience.

The composition of the attendance (Table I) is of interest in itself: the total of 41 'Users' out of about 170 participants is heartening, as was the note of enthusiastic surprise with which the others reacted to 'user' views. Pressure-group representation was not limited to the floor, and appeared on the platform to make their cases in the quasi-academic format of such meetings. The closing session of the Forum gave a dozen major freight-transport users the platform to state the problems that they would like to see addressed by the assembled transport expertise in the hall. The full range of macro-economic and market effects of transport to the most detailed freight-handling system questions were identified in different terms. The slow communication of much of the already available and known useful work in these fields is clearly due to the reluctance of transport and transport policy workers to make widely available the details of specific applications of such knowledge, and due to the commercial sensitivity of such detailed case-studies when carried out from a 'user' standpoint. The absence of passenger transport users—other than operators—from the podium left an unbalanced perspective which should be corrected by car, bus, rail and ferry users and transport environment and provision pressure groups at the next (5th) ATRF in Sydney in 1979. The repeated offers of data and co-operation from the podium must have heartened many of the transport specialists on the floor, although the low level of representation from Operational Research and Management Science groups gave rise to little response to the repeated pleas for better manpower planning, organisation, productivity and motivation aspects in transport investigations.

The keynote address could only have been given by a person outside the transport establishment, yet frequently called upon to undertake reviews of transport issues or decisions. Stewart Joy[1] made a number of telling points, notably that: 'Ministers are unable to drag these improvements out of the organisations under their control, because they have no reliable source of advice independent of the organisations themselves'; and 'we do not have significant transport research capability applied to criticising present transport policies and practices because our institutional structure does not provide either for the funding or eventual use of such work'; again, 'in Australia we lack the critical users of transport criticism and commentary'; and finally 'whichever body organises the research, it will come to nothing unless its results are published, simultaneously with their submission to the government'.

The papers lived up to the goals of broad spectrum interchange between different areas of transport, with strong sea, air, rail and road representation. Papers on the role of optimisation in transport[2], the methodology required for sensible decisions in airport studies[3] and the contribution of corporate planning to railway operation[4] did little to encourage those aiming for a higher level of mathematical sophistication in transport applications, while sustaining those with the more pragmatic goals of greater numeracy and commonsense.

The transport modelling session was interesting as each of these papers was concerned with better methods of numerate appraisal in areas where almost any attempts at quantification raise more problems of relevance than the improved numeracy would assist in resolving. Skinner and Symons[5] have developed an initial model of choice and demand for outdoor recreation which has proved to be of immediate utility to such groups as foreshore planners by giving a practical numerate basis for access provision and environmental capacity. Starkie[6] pointed out the limited utility of modal *choice* modelling in practice, and the subsequent discussion brought out the present need for total patronage and response models now that mode-switching has been shown to be comparatively insensitive to short-run variations in price and frequency once the groups with the *option* to switch have been identified. Morris *et al*[7] from ARRB reviewed the confusing range of accessibility measures and indicators and showed how behavioural choice models and accessibility measures must be considered together due to their common roots in utility theory, pointing out that the complex structure of successive legs of a single journey must be treated more thoroughly if either accessibility or mobility measures are to be of practical value.

The fuzzy edges of road public transport were given practical form by three different forms of shared ride or demand responsive systems. Dick[8] drew conclusions for Australia from the Indonesian *bemo* carriers; Rechtfort[9,10] made the taxi-industry case for proper treatment of taxis as public transport; and Usher[11] reported on the experimental demand-responsive bus service which his company has been running in an outlying suburban area of Melbourne.

Transport economics and pricing policies were reviewed by Dowers and Kolsen[12] from the standpoint of subsidy policies and the resource allocation which follows political choice of price level, and the overall subsidy of rail and taxation of road transport was discussed. Steeper[13] com-

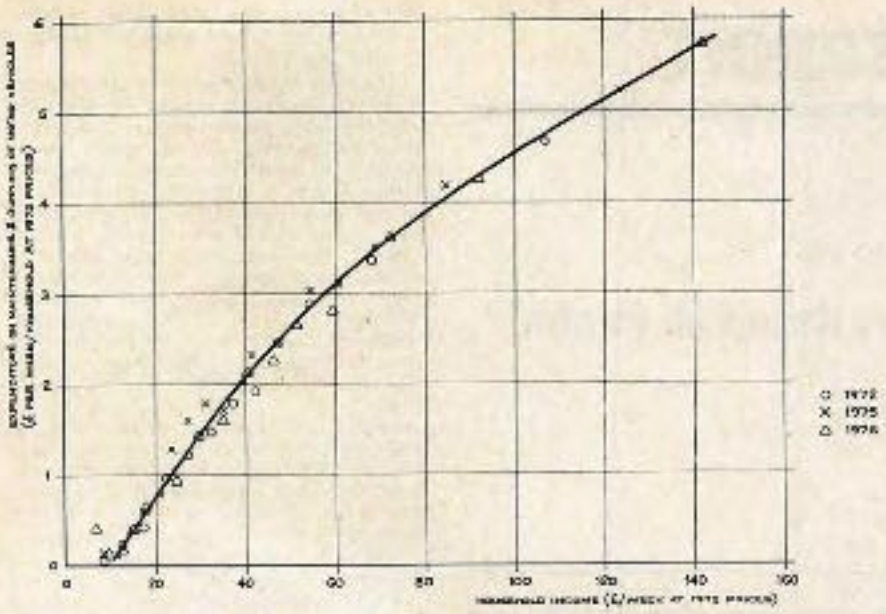

Fig 3. Expenditure on motoring use and income.

ACKNOWLEDGMENT

The author is grateful to John Wootton and John Tanner for comments on this note.

REFERENCES

1. MOGRIDGE, M. J. H. An analysis of household transport expenditures, 1971–75. Paper presented to PTRC Summer Annual Meeting, University of Warwick, June 27 to 30, 1977.
2. MOGRIDGE, M. J. H. The effect of the oil crisis on the growth in the ownership and use of cars. *Transportation*, 7 (1), March 1978, 45–67.
3. DEPARTMENT OF EMPLOYMENT. Family Expenditure Surveys, 1972, 1975 and 1976. HMSO, London.
4. MORRIS, J. M. and M. R. WIGAN. Transport planning: A family expenditure perspective. ARR Report No. 71, Australian Road Research Board, February 1978.
5. BATES, J., H. GLUNN and M. ROBERTS. *A disaggregate model of household car ownership*. Research Report 20, Departments of the Environment and of Transport, London, 1978.
6. DEPARTMENT OF TRANSPORT. Notes on cost parameters for use in transport modelling (unpublished).
7. DEPARTMENT OF TRANSPORT. *Transport Statistics 1976*. HMSO, London, 1977.
8. DICK, A. and H. J. WOOTTON. Transport planning and modelling (Ch. 2). Teach-in at the Institution of Civil Engineers, London, 1977.
9. TANNER J. C. Car ownership trends and forecasts. TRRL Report LR799, Transport and Road Research Laboratory, Crowthorne, 1977.

The author's address: Wootton, Jeffreys & Partners, Cemetery Poles, Brookwood, Woking, Surrey GU24 0BL.

Estimating vehicle-kilometrage

Expenditure on maintaining and running vehicles is closely related to the amount of travelling they do. The DTp estimate[6] of behavioural operating costs of cars in 1976 is 1·75p/km at 1976 prices. From Table I, the average expenditure per household on running motor vehicles was £3·76/week at 1976 prices. The amount of car travel per household in 1976 was thus probably about 376 × 52/1·75, or 11 000 car-km. Assuming a total of 19m. households gives a total $210 \cdot 10^9$ car-km run by households on all roads in Great Britain in 1976. The total travel by cars and taxis on roads in Great Britain in 1976 is estimated in the Department of the Environment's *Transport Statistics*[7] to have been about $125 \cdot 10^9$ veh-miles or $200 \cdot 10^9$ veh-km. This last figure includes business travel, the cost of which will not have been included in family expenditure. Also, in view of the assumptions and errors involved in deriving the figures, comparison between them should be made with caution.

Forecasting

Car-ownership has been widely used as a basis for forecasting traffic growth (see, for example, Dick and Wootton[8] and Tanner[9]) and ownership models have incorporated income and motoring costs in some form or other. The relative stability as found here of expenditure on running vehicles before and after the oil crisis suggests that models for forecasting vehicle-kilometrage based on running expenditure might be usefully explored. In this connection it is worth noting that the amount spent on using a motor vehicle has a direct relation to the amount of travelling done and an approach of the kind used in deriving Fig 5 can be regarded as giving some insight into spending by households on private transport.

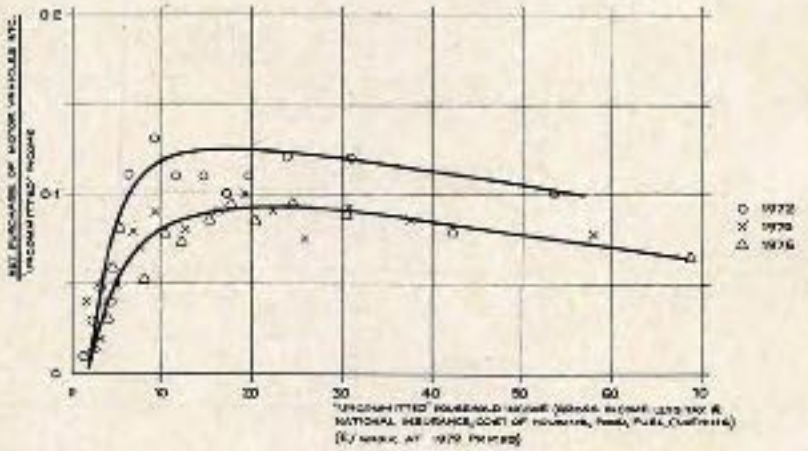

Fig 4. Proportion of 'uncommitted' income spent on purchase of motor vehicles and 'uncommitted' income.

Fig 5. Proportion of 'uncommitted' income spent on running vehicles and 'uncommitted' income.