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Research needs in transport

Introducers *V. E. Jones, OBE, MSc, DipTP, FICE, MRTPI, FIHT,
C. Gore, BA, and M. P. H Heyes, BSc(Eng), PhD, MICE*

Reporter *B. G. Ratcliffe, MSc, MICE, MIHT, MCIT*

- Mr Jones outlined the tasks of the Review of Transportation Research and Education Panel and explained that the breadth of the review was reflected in the composition of the panel. The review was timely because travel demand overall was increasing at a rate which was substantially faster than effective capacity would or could be expanded. Transport was operating near to capacity for a greater period of time and transport policies were increasingly preoccupied with demand management.

The current tools for analysing transport problems derive largely from the policy and technical concerns of the 1960s and early 1970s and they have not kept pace with behavioural research and current policies. New fundamental research into travel demand should be carried out, concentrating on responses and adaption, over time, to changing opportunities and pressures; this should rely more on empirical methods. Other characteristics of travel, notably safety, the impact on the environment and the causal relationship between land use and travel, were of equal concern to the panel.

Mr Jones said that Britain was at the bottom of the European league for transport research funding and expenditure on research and development (R & D) was lower than in France and Germany. Public expenditure on R & D expressed as a percentage of gross domestic product (GDP) is shown in Table 1.

A Department of Trade and Industry (DTI) study noted the financial short-termism of British Industry R & D and this could be attributable to the domination of share holdings by financial institutions such as the pension funds, which were biased to short-term gains. Industry has been traditionally reluctant to find medium and long-term research and was more concerned with applied than fundamental research.

Mr Jones highlighted the importance of the research funding councils and the problems in

universities. The new University Funding Council (UFC) procedure has resulted in university teachers becoming too dependent financially on their commercial activities. According to a recent report by the Association of University Teachers funds allocated by UFC for basic research was being shifted to prop-up inadequately funded industrial and other short-term projects.

Mr Jones identified three basic questions,

- How much research was being done and how was it funded?
- Which were the priority areas?
- Which mode of Transport was the subject of research?

He saw a need for an overhaul of postgraduate courses to provide for the needs perceived by employers and to avoid overlap between institutions; he suggested that it was an opportune time to produce a mark two version of the study *Transport planning—the men for the job*.

Mr Gore explained that the increasing incidence of congestion during the 1980s was instrumental in placing transport on the political agenda of the 1990s. At the same time pressures concerned with the quality of life, the risks associated with global warming, and environmental concerns were also seen as key political issues. The dissonance between policy objectives in these two areas represented a major political dilemma. It was important to recognize the potential contribution from research work in resolving that dilemma.

In common with our partners in the European Community, the UK Government had made international commitments to adopt policies which would ensure that the emission of carbon dioxide, the dominant greenhouse gas, would be stabilized at the 1990 level by 2005. It was important to recognize that this policy objective was not solely driven by the desire to ensure that the UK made its appropriate contribution to global objectives, but also by the need to negotiate with developing countries with some moral authority.

Mr Gore pointed out that in the UK the passenger transport data revealed a picture dominated by an inexorable growth in car ownership and, more significantly, in car usage. (Car mileage had risen by 50% since 1980). The deep-rooted factors which were responsible for

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Table 1. Expenditure on R & D as a percentage of GDP

Country	% of GDP*
United Kingdom	0.61
France	0.91
Germany (FGR)	0.93

* Source SERC 1989

this trend were expected to continue well into the next century.

Mr Gore explained that the growing integration of the UK economy within the European Community had been, and would continue to be, accompanied by a Community-wide phenomenon that the volume of freight transport was increasing disproportionately more rapidly than the output of manufactured goods.

Mr Gore explained that the research agenda for the review was broad and would need to embrace a wide range of approaches. The very breadth of the research agenda would inevitably mean that identification of research priorities would not be easy. He suggested that in making the inevitable choices the central criterion must be the question 'what is the potential contribution from this particular research initiative to resolving the difficult policy dilemmas which Government faces in this area?'

Dr Heyes pointed out that transport research in the UK appeared to have stagnated, probably because of successive governments' lack of interest in transport. He considered the pressures to be growing and with transport issues moving up the political agenda he thought it was time to revise the research needs.

With regard to transport demand Dr Heyes pointed out that despite the fact that today's problems were largely forecast some thirty years ago, it was only now that it was becoming accepted that demand would need to be managed. The early research into the land-use/transport inter-relationships had proved relatively stable in uncongested situations but gave us only limited help in formulating development policies in the current climate. Much historical data existed, but the challenge to the researcher was to explain the trends in car ownership and use in terms of changing land-use patterns, infrastructure provision and socio-economic values.

He then turned to the question of the capacity of the existing transport system. UK road design capacities had been revised upwards on several occasions, but the question of level of service had always been side-stepped. The time was right for an improved understanding of practical capacity, especially as the Government's motorway widening unit becomes more active. In addition to the issue of system capacity, new technology could potentially make a significant contribution to the operational aspects of both road and rail services. Urban traffic control had been around for some time, but the technology was only now being applied to motorways and inter-urban road networks.

Dr Heyes pointed out that one of the most important current issues was the carnage on our roads. Much useful work had been done on road safety engineering aspects, but traffic accidents are essentially a behavioural problem and a great deal more research was needed on

this topic. The need was to understand driver psychology better, both to influence behaviour and to target accident reduction measures.

Much effort was put into education and training, but most of it, he felt, was an act of faith.

There was a lively discussion on the scope of the *Transportation review* and a speaker questioned whether or not the terms of reference included civil engineering transport structures e.g. highway pavements. Mr Jones said that the terms of reference for the review were very broad and included all modes of transport and their operation. There were some fringe aspects that were more appropriate to research in engineering and construction.

A speaker questioned the composition of the panel and suggested that it should include a transport user. Mr Jones pointed out that the panel included representatives from a wide range of transport interests and that people and organizations from the vast spectrum of the transport industry had been invited to put their views to the panel. Another speaker stressed the importance of including the interests of pedestrians and cyclists and Mr Jones pointed out that the appropriate organizations representing their interests had been invited to submit evidence to the panel.

A speaker referred to the role of the Research Councils and pointed out that the review was intended to cover those issues dealt with by the SERC Transportation Sub-Committee.

A speaker outlined the work of the Department of Transport and, in particular, research carried out by the Transport Research Laboratory. The allocation of funds for specific research areas was explained and it was pointed out that the transport sector was competing for a share of the Government's finite financial resources.

The problems of overlapping research projects was raised by one speaker and this was taken up by another who thought that the instances of overlapping were fairly rare. Researchers in Higher Education Institutions communicated through the Universities Transport Study Group and discussed their work at their annual conference and other meetings. Another speaker raised the questions of confidentiality in research work and reports. Mr Gore pointed out that as far as British Rail was concerned there were examples where confidentiality was safeguarded by the researchers presenting the results in a form acceptable to the sponsors. A speaker expressed his concern at the difficulty in obtaining information and reports produced by the Department of Transport and made a plea for information to be made available at an earlier stage.

The discussion continued on the need for more funds to be made available for transport research and on the importance of undertaking both fundamental and applied research.

Mr Jones pointed out that there was considerable scope for more work in behavioural studies and there was a need to reflect new policies and the role of other modes. A speaker pointed to the importance of people's understanding of the cost implications of different modes of transport.

The teaching of transport was discussed and it was pointed out by one speaker that the *Men*

for the job report recommendations were not implemented. Another speaker pointed out that SAUS at Bristol was not set up to do what had been recommended in the report. A discussion continued on whether or not the need for postgraduate training was being satisfied. Mr Jones pointed out that the opinion of the employers of postgraduate students was particularly important to the review.

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Runway resurfacing experiences

Introducers

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■ Introduction

The speakers based their introductory remarks on the three papers published in ICE *Proceedings* Part 1, published June 1991.^{1-3*}

Runway resurfacing

G. Austin reminded the audience that much of today's airfield pavement practice had been developed over the past 50 years by trial and error and he emphasized the value of all experience and feedback. He chose to highlight three aspects of pavement resurfacing mentioned in greater detail in his paper: reflective cracking, surface characteristics, and dowelled/undowelled concrete slab construction.

Reflective cracking Concrete slabs and rigid bases to asphalt surfacing expand and contract according to the ambient temperature producing tensile strains in asphalt overlays. Live loading causes the slabs to deflect vertically by bending causing flexure strains in asphalt overlaying joints. Whereas warping occurs due to the temperature differential between surface and base of the slabs resulting also in flexure strain. These movements individually or in combination lead to fatigue cracking which may propagate upwards or downwards from the surface, reflecting the line of discontinuity beneath the overlay.

Crack prevention methods include the use of geotextiles or slip sheets blanketing the whole pavement to relieve movement between base and overlay, 'Band aids' applied hot or cold in strips directly over cracks and joints prior to overlay act as stress absorbing membranes. Hot applied fibre reinforced compounds are traffickable and applicable as buried membranes or surface sealing bands to asphalt overlying con-

crete joints. Where warping is the cause of cracking in the tensile zone over joints, the use of such reinforcing bonds near the top of the overlay is more beneficial. A composite pavement consisting of asphalt laid upon concrete block paving has been trialed and may offer the possibility of eliminating reflective cracking in the future.

Surface characteristics It must be recognized that good surface texture alone does not guarantee good frictional resistance. Other factors including drainage, crossfall and microtexture of the coarse aggregate and dense asphalt mixtures are also essential.

Dowelled/undowelled concrete slab construction Mr Austin recalled that the arguments for dowelled or undowelled joints were long standing. He acknowledged that pavement quality concrete (PQC) construction practice for aircraft pavements was predominantly undowelled. Many designers including BAA in the UK adopted the PSA policy of unreinforced slabs without dowels. However Mr Austin suggested that in the longer term the restraint at joints in dowelled pavements helped to minimize reflective cracking when overlaid with asphalt. This should be borne in mind by pavement designers. Similarly, designing aircraft pavements for future overlay, by minimizing joints with the use of continuously reinforced concrete should be considered.

Manchester Airport

W. S. Davies supported the proposition that the use of dowels improved pavement performance and cited a taxiway at Manchester Airport overlaid in 1979-80 that had successfully carried an 86% increase in traffic over the following ten years.

Mr Davies went on to describe the problems associated with resurfacing work at a very

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* Mr Evan's introduction was based upon the paper written by J. C. Parish BSc, MICE