RESHAPING A MAJOR BUS SYSTEM: OPPORTUNITY, ANALYSIS AND ACTION

J R Brew[1]
Chief Executive
State Transit Authority
New South Wales

ABSTRACT

Recent legislative changes in New South Wales have created an opportunity to reshape the way in which the State Transit Authority operates, both in the cost of operation and the quality of service provided.

Consultants were used to identify the feasible scope of change, and to define and propose a new structure for the necessarily more detailed dealings between State Transit and the Ministry of Transport.

Some problems identified will require co-operative solutions with other organisations, such as road space management, and these are being addressed. A proposed universal time-based fares system will permit major operating economies, and will generate new traffic among discretionary riders.

A new divisionalised organisation, with considerable delegation of authority, will progress the changes initiated by the consultants. At present levels of Government supplement for pensioner and student travel, State Transit hopes to break even on full costs by 1994-5.

(1) The assistance of Stewart Joy of Hyland Joy & Associates and Graham Simons of London Transport International, in both the preparation of this paper, and the investigations and analysis which underlie it, is acknowledged.

1. INTRODUCTION

This paper describes the changes which are currently underway in State Transit, the legislative changes which provoked them, the way in which needs were identified, and the implementation process

The Transport Administration Act 1988 changed the basis on which public transport is administered and managed in New South Wales. The distinction between administration and management is important; the blurring of these quite separate processes was the primary cause for the unsatisfactory performance of State Transit's predecessors.

The former Act[2], and way in which it was administered, was a classic piece of public authority legislation and administration of its day, enabling governments to influence the authority in virtually any way they wished, and to make up the resultant operating deficit each year.

This had two unhappy results First, because there was no real pressure for change the management came to regard its mission as continuing the same services in the same way, without much regard for the increasing burden imposed on the public purse. Second, in such an environment, some good managers took opportunities to move elsewhere, and an introspective inertia became the predominant culture of the organisation.

The new Act provides for an altogether different management and market environment. This paper describes the transition, the achievements so far, and the size of the task remaining

2. IDENTIFYING THE OPPORTUNITIES PROVIDED BY THE NEW ACT COMMERCIAL SERVICES

In future, State Transit will be required to distinguish in its financing (but not necessarily in the quality of service provided) between "commercial" and 'non-commercial" activities. The clear intention of the Government is that, as far as possible, the State Transit Authority should operate in a fully commercial environment, covering its full costs with revenues

Even with these commercial services, the Act provides that significant changes should be discussed with the Government in advance of implementation, and that if the Government should require amendments to the proposed changes which will impose a significant financial loss on the Authority, the consequent loss will be reimbursed from public revenue.

2 The Transport Authorities Act of 1980

The information requirements which the Act imposes on State Transit for the purposes of these reviews are broadly similar to those required for the Authority s internal decision making.

In general, data will be required on the cost and revenue effects of the proposed change, the details of passengers and others affected by the change, and the general gains and losses to Sydney 's public transport system which will result. In the more important proposed changes, the Government will make public these details to assist community understanding and acceptance of the proposed alterations to service.

Because State Transit is in the process of making major reductions in the cost of providing its services, and some of these will take some time to have effect, it has proposed that the definition of Commercial Services should be based on the expected future cost levels, and that while it is achieving these cost levels, the Government should make up an agreed amount of the historically-based excess costs being incurred

Many of the cost savings will themselves require substantial initial investment. Although State Transit will finance most of these from the sale of assets no longer required, it does not have financial resources necessary to support present excess costs on its commercial services. It is expected to agree to a program of these improvements with the Government, which will include interim financing arrangements.

NON-COMMERCIAL SERVICES

Some services cannot generate revenues sufficient to cover their costs at levels of fare which meet the Government's other transport policy goals. For these, the Act provides for a process of consultation with the Government, after which the additional cost of the agreed non-commercial services, taking account of the revenues concerned, will be met by the Government.

State Transit has proposed a program of review of these services, beginning with those which impose the greatest financial burden on Government. This review cannot be completed within the 1988/89 financial year, and the Government's agreement to provide interim financial support has been sought.

THE REVIEW PROCESS

If for social reasons the Government does not wish to see a substantial change made to a commercial service, it may choose to provide financial support for the retention of the status quo, either permanently, or a specified period.

Reviews of non-commercial services will be at the Government's discretion. Between reviews, State Transit will advise the Ministry of passenger volumes (from surveys) and any departure from expected revenues will be reported. Costs would normally be expected to move in step with general bus operating costs.

Some reviews, especially those which may lead to major change, will be given special publicity and public consultation will be invited.

ONGOING ARRANGEMENTS

Once a non-commercial Service payment is agreed, the revenue and traffic on the service will be monitored so that the Government can verify at any time that the envisaged social need continues to be met. If despite all efforts, traffic falls below expectations, the revenue effect on State Transit will trigger a request for a review of the service.

FINANCIAL GOALS AND CONSTRAINTS

Under these provisions, State Transit expects to be breaking even, according to full commercial accounting standards, by 1994/5.

The following steps of financial rearrangement have been made necessary by the new Act -

1. State Transit had to identify its replacement needs on a commercial basis The annual provision for this replacement of buses and ferries had to be built into its cost base for both classes of service.

2. Realistic provisions were required for other continuing liabilities - public risk, pensions, and similar costs to be built into the cost base. The funding of these is still under discussion with the Ministry and Treasury.

3. Agreement had to be reached with the Government on the future payments for **pensioner and other concession** travel for which the State Transit, as a commercial operation, would not be assuming responsibility. The future level of these payments will depend on the relationship between pensioner and ordinary fares

With **students'** concessions, the balance of costs and revenues is not known with precision and the Ministry is assisting with a large study to identify student travel and assign it to State Transit routes.

Thirty percent of State Transit's travellers are students or pension card holders. They contribute, with fares and Government contributions, about 40% of State Transit's revenue. This requires detailed evaluation to ensure that the Government is receiving value for money for its support.

4. After fixing a future basis of concession fare supplements with the Government, State Transit must then define its commercial services in the light of expected revenues (both direct, Government concession and supplements), and the **expected costs** when presently identified cost reduction programs are completed.

5. This commercial service network, which will include some ferry routes and major bus routes, will break even.

6 After that, non-commercial services must be agreed with the Government, either as single routes or as groups of routes. The Government will pay the difference between the revenue of each service, and the costs which would be saved if it were to be withdrawn.

The new Act does not provide total commercial freedom. After breakeven is reached, State Transit will not be able to report a profit performance **better** than that. To do so would indicate that it had been either overcharging passengers or overcharging the Government.

To summarise **the financial position,** in the next four years -

* State Transit's operating costs will be reduced as efficiency is improved,

* revenues should rise in real terms as services attract more passengers and fare systems are made more productive,

* pensioner concession reimbursements will depend on fare movements, and will more accurately reflect the amount of pensioner travel on particular routes.

* school concession reimbursements may remain the same, with a different mix of school services to keep State Transit's costs within the total revenues,

* Government payments for non-commercial services will rise, until State Transit breakeven is achieved.

4. STATE TRANSIT YESTERDAY

In the recent past, State Transit's efficiency has lagged among Australian city transit operations; it is the biggest, but not necessarily the best.

It provides street and ferry transport for the people living in the central areas of Sydney, and in Newcastle. Its 6500 employees and $ 300 million worth of buses, ferries and other assets transport 750 000 people on each week day

Of these, about 205 000 of its daily travellers go to and from the Sydney central city area. On a typical week day State Transit carries 175000 passengers to work, and 140000 to school. In addition, about 115000 people per day use the bus and ferry services for private, pleasure and shopping trips, of whom about 95000 travel on pensioner concessions.

The city commuter load is heavy, as shown by these morning peak hour bus loadings-

From the

North	13,000
East	2,000
South	4,100
South East	10,000
South West	8,200
West	6,000

State Transit's Sydney bus routes have the highest loadings among Australian Capital cities, but due in part to the pensioner and students' concessions, the fares are generally lower than those elsewhere

Although heavy traffic causes delays, lower operating speeds, and high costs, the cost recovery ratio can be considerably improved

Some interstate comparisons show the picture -

($ per bus kilometre): -

1987/88	Revenue	Cost	Deficit
Sydney *	1.03	4.87	3.84
(incl. Concession Supp)	2.81	4.87	2.09
Melbourne (inc.trams)	1.42	3.76*	2.34
Newcastle	0.61	2.72	2.11
Canberra	66	2.49	1.73
Melbourne (buses)	.73	2.38	1.65
Perth	66	2.08	1.42
Adelaide	1.01	2.38	1.37
Brisbane	1.17	2.28	1.11

* Adjusted for correct bus kilometres.
Source: ANZ City Transit Association

That was the system the consultants were set to analyse and propose improvements. To do this quickly, in a time of concurrent managerial reorganisation, State Transit called on the help of consultants experienced in bus operations and in the management of relations between transit organisations and sponsoring governments.

5. THE CONSULTANTS' APPROACH ANALYSIS

The first task was to assess where State Transit was, in market, efficiency and institutional control terms, to identify the most productive paths to improvement, and to set the organisation moving toward demanding but achievable goals.

Some changes were already happening. A decision to decentralise management was reviewed and endorsed, and a task force set about refining the details. The finance function was moving quickly toward a commercial basis of accounting, and non-operational properties were being identified and sold. Following advice on contracting of maintenance activities overseas, some in-house engineering activities whose cost exceeded bought-in prices were being closed

The first tasks of the strategy consulting team were to establish the scale of feasible improvement, and to start the process of reducing the system to profit accountable entities.

The results of the search for feasible boundaries for operational improvement are set out in the comparisons with other Australian systems set out above.

Identification of profit accountable entities was vital both for the new divisional Managements, and in order to comply with the information requirements for non-commercial service payments under the new Act. There was a view among some managers that State Transit could only be considered as an indivisible whole, but this approach, where nothing could be questioned and therefore nothing could be changed, was at the root of the problem being addressed.

OPERATIONAL SURVEYS

In a system where a large number of buses run on a variety of routes in the course of each shift, and nearly 70% of fares are on pre-paid multi-ride tickets, it was not possible to develop route-specific analyses of operations. Even the depot profit and loss accounts which the consultants were able to develop were subject to coarse attributions of revenue from common sources. This deficiency is being corrected at the moment, using State Transit's normal traffic survey data as a basis for route-apportionment of revenues.

Studies of bus-runs and analysis of drivers' times both showed a high level of time devoted to layovers on changing between routes, and for timekeeping purposes between runs on busy routes.

Detailed all-day on-bus surveys of riders' ticket purchases have been used to support changes in ticketing methods and to validate the use of kerbside surveys for estimation of passenger kilometres and revenues by routes.

OPERATIONS

The operations were found to show many of the characteristics of a transit authority which had been given generous access to capital and operating expenditures. High bus spare ratios allowed slack control of maintenance. Loading standards were generous (maximum 50 passengers) - there are more people standing on the premium fare Airport Express buses than on normal peak services.

A concentration on timekeeping perfection had led to handsome layover provisions, with the result that drivers productive hours were low. The lack of run-through services in the city meant that for the whole day too many buses were parked in city streets awaiting departure times. The flexibility of the bus had led to the creation of many special routes, off normal routes, to serve special markets for which revenues were poor relative to costs.

Outdated on-bus fare collection methods relied on manual issue of pre-printed value tickets. Ticket checking had been allowed to fall below the level necessary to detect and eradicate passenger irregularities.

The absence of computer scheduling outputs necessitated operators being given generous signing on allowances to record their daily duty variations. Although a bus radio system was installed it had not been exploited as a tool to improve operational control, merely dealing with breakdowns and emergencies.

Criteria for service provision were not formally defined causing difficulty for service planners when services were being revised.

Comprehensive information on passenger movements was very limited creating an urgent need to set up a reliable data base.

MAINTENANCE

State Transit's maintenance practices were assessed against modern overseas methods. The number of buses used for the present Sydney services was found to be high by the standards of other Australian government-owned bus systems, and the present cost of maintaining those buses is excessive.

Among mainland capitals (including Canberra), State Transit Authority's maintenance productivity (buses per mechanic) ranked lowest, at 58% of the national average. The cost of bus maintenance will reduce by 40 cents per bus kilometre, or nearly $ 20 million, with no diminution of passenger service or safety, by the end of 1989.

The practice of doing "half-life" overhauls on buses due to be sold was questioned, and the whole policy of heavy overhauls was found to be unnecessary with the modern bus bodies now in use. These changes not only allowed the closure of the two heavy overhaul facilities, but allowed a dramatic reduction in fleet numbers.

Another problem was the rigid vertical organisational divisions. The only level at which operations and maintenance were in the hands of one person was that of the Chief Executive. Problems were not resolved, and depots and garages (which were often the same site) were often in conflict. Under the new divisional administration, depot managers will control both functions, with positive results already evident.

COSTING

Consultants are developing route costing methods for use both in planning within divisions and for discussions with the Ministry on non-commercial service payments. The voluminous traffic count data already available will be used to estimate passenger kilometres on each route for revenue estimation purposes.

RELATIONS WITH GOVERNMENT

The new Act creates a totally novel relationship between the Government and State Transit. The Government can have or retain any service it wants, but if revenues fall short of costs, there is automatic provision for a non-commercial service payment. The decision-making process between the Ministry and State Transit has yet to be evolved, but it will lead to a much healthier relationship than in the past.

The Minister has left it to State Transit to make practical proposals on the way in which this new process might work. Because the Ministry of Transport is already required to oversee the levels of service provided by the private bus operators in other areas, it has expressed an intention to treat State Transit in a broadly similar manner.

The difference, of course, is that State Transit is required to detail the results of particular routes to the Minister, and to discuss service levels, revenues and any necessary payments. Because of the present inadequate levels of efficiency in State Transit, consultants have recommended that these discussions with Government should be on the basis of prospective rather than present costs.

VERIFICATION

A three way system of checks was used to validate the global projections being offered as targets in the corporate plan. As the change programs were identified and the benefits evaluated, these were combined to check against the global productivity goal. At the same time, other Australian systems' costs were used as a datum. Then, to check the reasonableness of the detailed programs, the expected results of these were compared with physical productivity measures from elsewhere.

In the course of this verification progress, the consultants identified the traffic system problem which will be described below.

MONITORING

Along with all of the other changes at State Transit, financial control systems are being developed by the general manager, finance, with which to control the businesses at divisional and depot level.

A move to zero-based budgetting will establish overall control over expenditures, and will instil in line management the appropriate interest in *net* rather than *gross* outcomes of operational decisions. The role of State Transit is to carry people, not to run buses and ferries, and in future every trip must have a purpose which is reflected in meeting passengers' needs.

A system of performance goals setting, monitoring and publication has been instituted.

In future State Transit will measure its performance in terms of how well it uses its human and other resources to carry passengers. Most indicators will be expressed in passengers per unit of input, whether labour or bus hours, ferry hours or kilometres, and in physical measures which depict the quality of service provided to passengers.

Because an organisation like State Transit is judged finally on the cost of the service its passengers obtain, and on what they are prepared to pay for it, there will be a heavy concentration in future on the cost of key units of output.

Service quality measures will concentrate on -

average delay, (actual interval minus scheduled interval before a service with free capacity arrived) measured periodically at key points on most routes in the network,

trips run, compared with trips scheduled, measured in bus kilometres

connection reliability at interchanges, (average wait times, compared with scheduled wait time)

queue lengths at major termini, & average delay before boarding

passenger-injury accidents per million bus kilometres

Efficiency measures will be -

revenue bus hours per employee to show State Transit's effectiveness in concentrating its activities on creating service availability for passengers.

passengers per bus (pass km./bus km.) to show the effectiveness of scheduling according to demands

revenue kilometres per bus, to show State Transit's efficiency in using expensive bus assets

ferry passengers per peak hour (by routes) which is a measure of the marketing and scheduling efficiency of Ferries Division in relation to regular passengers

weekend cash ferry passengers, a measure of Ferry Division's success in marketing its services for tourist and discretionary travel.

bus changeovers per million kilometres which shows the incidence of on-the-road breakdowns

State Transit will carry out periodic surveys of users' perceptions of its services in order to monitor the more subjective elements. These will measure achievements of individual depots in areas like bus cleanliness etc., as well as providing information on passenger's perceptions of State Transit's performance as a whole.

6. BUS OPERATIONS IN SYDNEY
DEVELOPMENT OF THE NETWORK

Much of the present Sydney bus network still follows the original tramway corridors, and tramway practices still have an effect on bus operations.

The high density common sections encourage casual or spontaneous travel but the basic service on the suburban sectors of the routes is less frequent.

The lack of ability to transfer between most services meant that from many routes day long services were provided to two city destinations, often at different frequencies, with consequent uneven intervals on the outer ends of routes and excess provision of service.

Provision for student traffic, 20% of the total, was made with an inadequate variation between term time and holiday time, with consequent wasted bus kilometres for 10 weeks each year.

REVIEW OF PEAK OPERATIONS

Sydney's day long service requires about 800 buses. The other 400 buses are for peak services, caused by the narrow time band in which city workers wish to travel, and student traffic.

The limited passenger capacity of present Sydney buses, with only 43 seats, was also found to be a problem, increasing costs without a commensurate increase in passenger service on heavy routes. Larger buses will move peak loadings with less buses and make a better use of the valuable central area road space.

Most of the four hundred buses which do only one effective trip in each peak operate on routes with intensive services. The same quality of service could be provided using fewer but larger buses. Eliminating many of these trips, by reducing frequencies either without adjustment for the greater loads or by operating larger buses, will significantly lower capital provision and operating costs.

SYDNEY TRAFFIC SYSTEM CAUSES HIGH BUS COSTS

The consultants' search for explanations of the high Sydney costs, compared with other Australian cities, led to an significant discovery.

It was already known that the quality and cost of service provided by Sydney buses was seriously affected by the intensity of other traffic in the area, but this was blamed on general traffic congestion.

Relative speeds of street transport operations in Australian capitals are -

Sydney (overall)	15 km/hr	Melbourne	
North	14-19	Buses)	20.5 *
East	10-13	Trams)	
South East	14	Adelaide	22 0
South West	13-15	Brisbane	17 0
Ryde	15	Perth	24.0

* Average of both tram and bus. In Melbourne, trams have fairway system protecting them from traffic.

Relative to the average speeds of the other cities, Sydney was incurring about $1.40 additional cost per bus kilometre. Compared with other Australian capitals, State Transit's enforced lower operating speeds cost about $70 million per annum.

Average speeds on present schedules are -

Weekdays	13-15 km/hr
Saturdays	13.3-15.3 km/hr
Sundays	14-16 km/hr

(range is due to varying layover lengths)

But a study of Sydney schedules disclosed that peak Sydney traffic was not the main problem

The problem is due to the traffic *system,* and not just to peak hour traffic congestion. This is shown by the small extra running time adjustments needed for the morning peak hour in Sydney[3] Elsewhere, particularly in Melbourne, traffic management has been used successfully to reduce traffic-induced delays to trams and buses, and State Transit will be encouraging the extension of bus priority in Sydney.

At the same time, State Transit has a way to go in reforming its own use of street space, and this is now a high priority.

7. IMPROVING BUS SERVICE

CENTRAL CITY

The section on diagnosis has already listed ways in which the accessibility of central Sydney can be improved for bus passengers, at the same time reducing the cost of providing service.

3 Only about 8 mins per 60 minutes i.e. 13%.

Interconnection of routes from different suburbs which formerly terminated in the city area will eliminate the heavy incidence of layovers, and the attendant congestion of particular areas with buses awaiting their departure times This is an undesirable feature of central area public transport in Sydney.

The increasing use of Travelpasses, which give unlimited transfer opportunities, and the future addition of transfer privileges to ordinary and Metroten tickets, have made passengers' use of the system much more flexible This flexibility must be extended to cash fares and ten-trip tickets.

With a zone fares system, the ability of all passengers to transfer between buses and time based tickets will permit -

* rationalised services
* improved off-peak frequencies, where the *interval* rather than the timetable will attract passengers
* shorter city queues
* programmed city stops, which will speed bus movement and loading, and improve use of road space

STREAMLINING CITY PEAK OPERATIONS

State Transit already operates 30 high capacity articulated buses. Future high capacity buses are likely to be specially designed rigid vehicles, which use less road space.

Ticket queues and boarding delays on high capacity buses will be eliminated by encouraging all riders on peak hour **high-capacity** and **express** services to have pre-purchased tickets. These can be either multiple ride tickets such as Travelpasses or Metrotens, or tickets purchased from machines located at boarding points.

Changes in city area bus operations will -

* free up considerable road and kerbside space,
* result in a saving of about 65 buses in the peak periods,
* give positive gains in service quality to passengers.

These savings will result in reduced future capital requirements and operating costs Much of the saving in operating cost will be ploughed back in improved service elsewhere in the network.

8. BUS OPERATIONS OUTSIDE THE CENTRAL AREA

COST-SAVING SERVICE IMPROVEMENTS

Service redesigns will -

* concentrate off-peak trunk services into lesser routes but high frequency schedules which do not require the public to be concerned about particular bus times.
* serve major destinations with more frequent connections than the half-hourly through services operated on many routes now
* reduce average schedule delay for all travellers from 15 minutes to 7.5 minutes (plus transfer), and the more frequent off-peak frequency on the outer legs will generate local traffic.
* still operate through buses would in peak periods.
* reshape services which divide to serve both Central and Circular Quay will be made.
* free suburban routes from city centre delays.

These changes will follow comprehensive ridership analysis.

9. IMPROVING BUS EFFICIENCY

DESPITE SYDNEY'S TRAFFIC, BUS OPERATIONS CAN STILL BE IMPROVED

State Transit's efficiency problem was found to be in two parts -

* schedule speeds caused by road conditions, mainly delays caused by traffic lights, and

* labour productivity, which is the measure of the way in which State Transit manages its staff and their equipment.

Interstate comparisons show the two dimensions of the problem

	km/bus	speed	bus hrs/ worker
Adelaide	63500	22	727
Brisbane	54000	17	1010
Melbourne	59000	21	792
Perth	60000	24	899
Sydney	37700	13-15	590
Average (All)	51300	21 7	727
Average (w/o Sydney)	59500	23 6	870

These numbers together highlighted areas for action in Sydney. They did not suggest that State Transit people are not working hard, but that in many cases their work has not been well used in transporting passengers.

SYDNEY'S EFFICIENCY GAP

Lifting Sydney's bus hours per employee to the average of the other three all-bus authorities would give a significant annual saving. Note that bus hours/worker is independent of traffic conditions. Because bus workers are subject to National Awards, except for the effect of an abnormal Peak: Base ratio, Bus Hrs/Worker is wholly a result of managed efficiency.

Improvements will be obtained through:

* Reduced peak hour trips = less buses in use = less crew cost. *About 400 buses do only one effective trip in each peak.*
* Reduced incidence of layovers by combining trips through connecting points,and shortening of layovers.
* End-to-end route combinations lift service quality while lowering operating cost.
* Greater productive time by the use of mixed role operators.
* Further maintenance efficiencies This will come from internal efficiency and from the further reduction in the fleet. Numbers in this plan are based on 1324 vehicles in service (plus spares), whereas potential rationalisation of peak services for present traffic could result in a significant reduction

10. CONCLUSIONS

Transport research is of value only if it leads to improvement. In this case, the size of the problem meant that the payoffs from early action were substantial Improvement now rather than perfection tomorrow was required.
The adopted method was to -

* measure operational results where possible,
* identify potential improvements,
* evaluate,
* test alternative approaches to define final set,
* check feasibility of global goals against interstate operational comparisons,
* order priorities,
* act.

With efficiency problems as large as those on State Transit, there was room for improvement on a scale great enough to offer benefits to passengers, staff (in negotiated packages) and the Government, which pays the bills where fares are insufficient

The sizes of the potential payoffs forced a search for achievable solutions now, rather than perfection tomorrow State Transit now knows the directions in which it wishes to go with its bus operations, and can undertake the necessary staff and community consultation with confidence that the potential payoffs are well worth the effort.