E. T.: friend or foe?

Adrian Gargett | **James Rowan** | **Mark Witham**

Director of Corporate Services | *Manager Corporate Systems* | *Business Analyst*

State Transport Authority of South Australia

Abstract:

A conversion to electronic ticketing is a major financial and operational commitment for a public transport operator. This conversion represents a move into a new area for organisations and past experience is of little value. The experience of other operators can therefore help in developing an understanding of the likely implications of introducing an electronic ticketing system.

On 27th September, 1987 the State Transport Authority (STA), Adelaide, South Australia, introduced one of the most integrated and comprehensive electronic ticketing systems in the world. The system covers all ticket types across all the STA's bus, tram and train services. The system has now been performing effectively for almost three years, although there were some significant initial problems in its introduction.

Using the Adelaide experience as a case study, the paper reviews the justification for electronic ticketing, the costs incurred and the benefits received, and describes the major lessons learnt.

Contact author:
James Rowan
State Transport Authority
GPO Box 2351
Adelaide SA 5001
Telephone: (08) 218 2429 Fax: (08) 211 7614

Introduction

Adelaide is the capital city of the state of South Australia. Urban development extends over an area of 74 kilometres in length by 30 kilometres at its widest point and has a population of just over 1,000,000. Some 54 million passenger journeys per annum are made on the public transport network through a vehicle fleet that comprises 701 buses, 21 trams and 131 railcars. The network is operated by a State Government statutory body, the State Transport Authority. A few private sector services operate to and from urban fringe and near country areas.

Criteria

In July 1983, following industrial representations on the deficiencies of the existing ticketing system, a comprehensive review was undertaken. The review demonstrated a need for a replacement ticketing system to overcome shortcomings of the existing system. The criteria for the new system were that it should:

(i) replace the life-expired and increasingly unreliable mechanical ticket cancelling system that had been in service for over 20 years;

(ii) provide a fully integrated intermodal ticketing system covering the bus, railcar and tram fleets;

(iii) accommodate the existing fare structure as well as overcome constraints placed on fare setting due to;
- limitations on the number of ticket types;
- lack of flexibility in defining validity conditions;
- inability to introduce Multitrip tickets.

(iv) reduce passenger fraud (eg sharing of tickets, re-use of pre-sold tickets and alterations to tickets);

(v) reduce employee stress (altercations due to unclear printing and security associated with cash holding);

(vi) provide reliable and comprehensive data on ridership and ticket sales.

An undertaking was given to industrial associations that there would be no loss of jobs as a result of introduction of a new ticketing system.

It was further decided that a new ticketing system should:
(a) reflect the current 'state of the art' as regards technical and operating characteristics;
(b) have a minimum operating life of ten years and meet pay-back provisions within that period;
(c) not result in any reduction in net revenue and preferably increase revenue;
(d) be easy for both passengers and employees to understand and operate;
(e) facilitate statistical analysis and data processing and be capable of interfacing with a central revenue accounting system;
(f) reduce workload on operational staff.

In the STA's case, revenue sharing, personnel reduction and faster boarding times were not requirements of the system, although these are often important criteria for organisations considering new ticketing systems. Abkowitz and Driscoll (1987) have defined performance criteria for reliability and maintainability of automatic fare collection (AFC) systems and have used these criteria to evaluate the performance of several systems in the USA.

Development and Implementation

The criteria for the new ticketing system were included in an invitation to tender issued in November 1983. Eight companies tendered submissions. However, not all met the criteria. During tender evaluation it was evident that a system based on the use of magnetically encoded tickets had the highest potential to meet the criteria. The effect of electronic ticketing systems on passenger boarding times was carefully evaluated to ensure services would not be delayed. In many cases faster boarding is achieved. A financial evaluation indicated a pay-back period of 7 years. The major financial benefits were expected reductions in fare evasion and savings in data collection costs.

Crouzet SA, Valence, France was the successful tenderer and a contract was let in February 1985. Delivery of ticketing equipment for installation at operating facilities and onto fleet vehicles commenced in November 1986 and continued progressively over a ten month period up to the launching of the ticketing system throughout the system on 27 September 1987.

The total cost of the system was $Aust 10.7 million (in 1988 $Aust.)

System Operation

Principle

The key principle underlying operation of the electronic ticketing system is that all fare paying passengers must be in possession of a valid magnetically encoded ticket which must be inserted into a validator every time a passenger boards a vehicle. By interpreting the magnetic encoding for date and time, the validator checks that the ticket is valid for that journey.

Ticket Types and Fare System

Three major ticket types are issued:

(i) Singletrip Ticket: A single journey ticket which allows transfers between modes and vehicles for 2 hours from the time of first boarding. It is purchased on-board a vehicle, from railway stations or from queue ticket sellers.

(ii) Multitrip Ticket: A ten journey ticket, with each journey allowing 2 hours of travel as above. It is pre-purchased before boarding a vehicle.

(iii) Daytrip Ticket: A ticket that allows unlimited travel from 0901 weekdays and all day on weekends/holidays. It is purchased on-board a vehicle, from railway stations or from queue ticket sellers.

For reasons of economy the Edmonson format (ie 66mm x 30mm x 5mm wide striping) magnetic striped ticket was chosen in preference to the larger credit card format.

The Adelaide transport network is divided into three concentric zones. Different fares are charged for travel over all 3 zones, for travel in two adjoining zones and for short distance trips (independent of zone boundaries). A reduced fare applies from 0901 to 1500 on weekdays.

Separate tickets are issued to regular fare passengers and to concession fare passengers (ie students, unemployed, pensioners etc).

Technical Operation

Over 3,000 items of ticketing equipment, comprising validators, control units, and power supply units are installed on 853 vehicles currently in service Validators are mounted inside the entry doors of buses, trams and trains. Bus operators update location data and sell tickets using a control unit. Portable units are used for ticket sales by on-board personnel on trains and trams.

Ticket sales and patronage data are stored on solid state memory cassettes. Ticket sellers and bus drivers hand in these cassettes at Depots together with cash revenue. There is automatic transfer of data to a revenue and statistics data centre at each depot. Each data centre compiles the statistical and accounting data for transfer to the mainframe computer at Head Office for processing

Booking office machines are used to conduct off-board sales of all types of tickets. They are also used to pre-cut, encode and serially number from blank stock, the Multitrip tickets that are sold exclusively off-board vehicles by third parties.

Operating Experience

In general both regular passengers and employees adjusted to the electronic ticketing system and the use of magnetic striped tickets within a few days. This was attributed to the ease of use of the system as well as the public relations campaign and the employee training programme that preceded the launch of the system

During the early months of operation some teething problems occurred. The major ones were:

(1) Defective Tickets:
A batch of several million magnetic striped tickets was defective and had to be replaced by the supplier. The presence of large numbers of defective tickets was the cause of most disruption to the system during the early months of operation and delayed identification and rectification of hardware faults

(2) Depot Software Problems:
Problems occurred with the software in the revenue and statistics data centres (RSDC) at depots. Considerable revision of the software was required. On-board software worked well.

(3) Equipment Faults:
During early months of operation a common fault was the swallowing and jamming of tickets in validators on board buses and railcars. This did not cause serious disruption but reduced employee and public confidence. It was corrected through adjustment of belts and roller guides. Some portable ticket selling machines, an item of equipment developed specifically for the STA, experienced a problem of premature loss of electric charge by batteries that was later rectified. Other items of on-board ticketing equipment and items of hardware in use at depots have operated at a high level of reliability.

The early problems were largely rectified during the first six months of operation.

Benefits

Key Benefits

The main consumer benefits of the new system are:

* introduction of a 10 ride Multitrip ticket priced at an attractive discount equivalent to 7 rides;
* a wider range of tickets (currently totalling 34 types) providing fare differentials within a two tier 'interpeak' and 'peak' daily time frame;
* better printed information on validity and use conditions

The key operational benefits of the new system are:

* improvements to fare setting resulting from much greater flexibility in introducing new ticket types, fare structures, discounting arrangements and validity conditions;

* improved on-board ticket sales handling involving reduced work load, reduced cash holdings, greater security and fewer altercations with passengers over ticket validity;

* a more efficient revenue accounting system through the operations of a computerised system;

* more accurate and comprehensive data on patronage and revenue, with availability of comprehensive daily patronage data (covering time periods, passenger types and routes) which now allows the better matching of services to demand;

* higher revenue through tighter validity conditions;

* reduced fare evasion, as a result of new ticket types that are less prone to misuse as validation is required on every boarding;

* cash handling benefits resulting from fewer on-board sales, ie less cash, greater security, time savings;

* scope to utilise technical features on the system and integrate them to develop other systems, eg an emergency radio call system and system to obtain vehicle location information

The significant advantages of electronic ticketing in the following two key areas are worth discussing further:

* Fares flexibility;
* Service planning

Fares Flexibility Advantages

An electronic ticketing system allows wide flexibility in setting ticketing parameters, namely:

* ticket prices;
* period and time validity limits;
* zonal and travel distance criteria;
* passenger categories

The former manual system was constrained by operational requirements that limited the number of ticket types offered and placed constraints on modifying the zone based fare system and setting a range of ticket price differentials that reflected cost variations according to time of day. The old system inhibited the introduction of structural reforms capable of enhancing revenue raising capacity. In particular it was not possible to increase the number of Singletrip tickets or introduce Multitrip tickets with the old equipment

An electronic ticketing system removes the lack of flexibility in setting and introducing different fare structures that was inherent with the previous manual, mechanical system. It has allowed the STA to:

* set interpeak fares independently of peak fares;
* set different fares for different types of passengers (although recently this has reverted to a simple distinction between 'regular' and 'concession' fares);
* set time validity to an exact two hours for Singletrip tickets.

It also has the potential to allow:

* changing the number of zones in the system (there are three at present);
* charging of differential fares for different times of the day or days of the week;
* setting time limits for transfers of various duration;
* offering periodical tickets for any period (eg a day, week or month) either for specific dates or for any consecutive number of days.

It is not desirable to introduce too complex a fare structure so not all of these permutations would apply. Provision has been made in the system for a maximum of 64 ticket types and prices, although this can be increased if necessary. Fare changes, so long as they do not alter the fare structure can be made at relatively short notice (a few days). The most notable ticketing reform undertaken by STA has been the introduction of the Multitrip ticket in place of the weekly and monthly tickets.

Service Planning Advantages

An electronic ticketing system can provide vital data for the development and planning of services. At the most detailed level data can be obtained daily from every vehicle to give first boardings and transfer boardings at every stop. This data can be used to great advantage in service planning. Use of the data by the STA has included:

* showing the serious impact that service reductions have on patronage, by comparing trends on routes with reduced services with those on routes which are unchanged;

* showing the progressive increase in patronage over time on new routes or on routes serving developing areas;

* showing that some vehicles, which from general loading observations appear poorly patronised, are actually well used because there is a lot of "on-off" travel on those routes;

* detecting trends that can be used to indicate an emerging need for a service review on a route;

* comparing patronage with resources used on a route to ensure that these are equitably distributed or demonstrated to Government which services which require the greatest subsidy;

* assessing the continued need for a service on particular days or times(eg Sunday) when economies are being sought;

* monitoring the increase in patronage on days of special events (eg the Christmas Pageant), to assist in the future planning for such events.

A future possible development which would further increase the value of data for planning is the installation of a system to count alighting passengers so that the total number of passengers on the vehicle at any one time can be assessed.

Cost Benefit Analysis

The Original Proposal

The original recommendation to purchase ticketing and associated equipment including software was made in 1984 and nominated a maximum expenditure of $6.0 million exclusive of rise and fall. In the financial analysis supporting this proposal the benefits were simply the avoided cost of the direct replacement of the old system and an estimate of the reduction in fraud. The original analysis showed breakeven after nine years at the 10% discount rate. Over the ten year life of the equipment, a Net Present Value(NPV) of $0.5 million was indicated. Adoption of lower discount rates resulted in progressively higher NPV's.

Initial Analysis Updated

In this section the investment in new ticketing equipment is re-evaluated. Firstly using current knowledge about costs and benefits that were anticipated in the original assessment, and secondly incorporating additional costs and benefits that were not predicted at that time.

(i) Benefits:
The following benefits have been realised and were expected at the time the original decision was made.

(a) Avoidance of capital cost of alternative system. Had the Crouzet system not been implemented, an upgrade of the old manual system would have been inevitable.

(b) Reduction in fare evasion. Expected fare evasion was estimated in detail However since that time patronage has reduced and the fare mix has changed. It is expected that fare evasion under the old system would have been correspondingly lower than initially estimated. The difference between what fare evasion would have been under the old system, had it still been in use now, and the estimated fare evasion under the new system provides a net benefit

(c) Reduction in time validity for a single trip from up to 3 hours to an exact 2 hour time limit. The Authority had a nominal 2 hour limit on transfers but was unable to fully apply this with the old equipment. In practice, passengers could make a second or return journey so long as it commenced within a period that could be up to 2 hours and 59 minutes of the initial boarding.

(d) Interest on advance revenue. This benefit, which is attributable to a change in the type of ticket made possible by the Crouzet ticketing equipment, is created by more extensive advance purchasing of tickets.

(e) A decrease in the labour cost of running the Head Office Revenue Accounting area.

In addition there were several minor costs and benefits that resulted in a small net cash inflow

The Present Value of all of these benefits is estimated to be $18.5m (expressed in $1987/88) over a ten year period ending June 1998.

(ii) Costs

The costs estimated in the initial analysis relate to contract items net of any foreign exchange variation Also included are the additional pay allowances for staff, increased maintenance, ticket purchasing, computing and rail ticket inspection costs. The significant development time spent by senior staff has also been capitalised. The Present Value of these costs is $17 9m.

(iii) Net Present Value

The NPV of the project excluding the unexpected benefits and foreign exchange variations to contract price was $0 6m.

'After the Event' Analysis

(i) Benefits

This analysis builds on the previous section by including, in addition, some benefits yet to fully accrue, but for which there is a high probability of realisation These benefits include:

(a) Flexible ticketing. By having blank tickets any changes to the pricing, fare structure, or zone structure can be readily accommodated by the system. Although the cost savings in fare changes under the new system are significant, they are influenced by a range of complex industrial and operational issues. Accordingly, his benefit has not been quantified in this analysis

(b) Service efficiencies These allow for fine tuning of services to better match demand. The estimated future benefit is the saving from removal of those services that are poorly patronised and would not have been detected without this patronage information.

(c) Avoidance of the capital cost of an emergency radio system. The Authority is committed to providing an emergency radio system to all buses for safety reasons. This will enable the operator to press a concealed button to send automatically by radio the details of the vehicle location. The Crouzet equipment on the vehicles can feed the location data directly into this system. This has reduced the expected cost of an emergency radio system by approximately 80% It is considered that the Authority would have had to meet the full cost of this equipment if it did not have the Crouzet system.

(d) Revenue handling reductions. A long term goal of the STA is to reduce on-board ticket sales and thereby speed up services and reduce revenue boarding costs. The new ticketing system has enabled the introduction of Multitrip tickets and the expansion of off-vehicle sales outlets. The benefit is the proportion of the current revenue handling costs that can be saved.

The Present Value of benefits based on post implementation experience and anticipated results is estimated to be $44 2m (expressed in $ 1987/88)

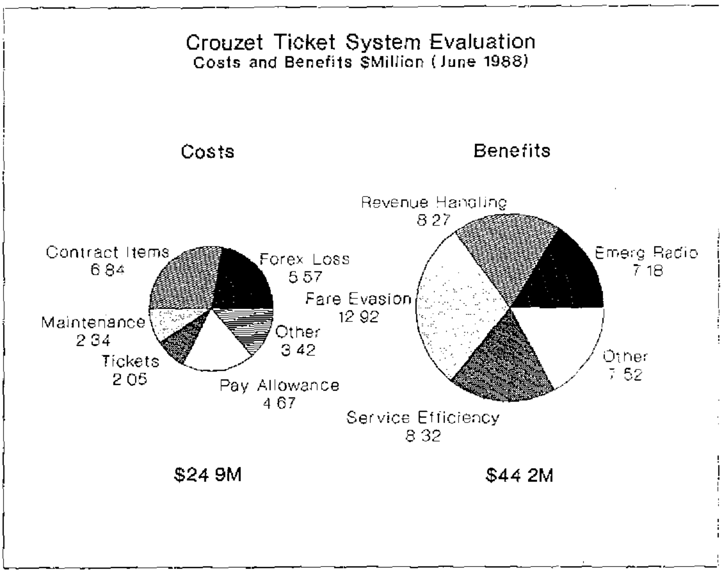
(ii) Costs

The only additional cost included is the foreign exchange variation. Exchange rates were steadily rising prior to the decision to purchase the new system and no reason was foreseen to hedge against a sudden drop in the exchange rate However, the value of the Australian dollar relative to the French franc fell by approx 35% during the contract period 1985 to 1987. The Present Value of costs based on post implementation experience and anticipated future results is estimated to be $24.9m ($1987/88).

(iii) Net Present Value

The NPV of the project is estimated to be $19.3m. Because some benefits are yet to be fully realised, sensitivity analysis has been undertaken, and is summarised in the following section.

The diagram below shows the relative value of the major costs and benefits.



Sensitivity Testing

The results of the analysis were subjected to sensitivity testing to account for variation in the two most uncertain benefit items: revenue handling cost reductions and the service efficiency improvements. These items were reduced by a factor of .5 and .75 respectively. This resulted in a drop in the NPV of the project to $13.1m.

Lessons Learnt by the STA

Gargett (1988) and Scrafton (1989) have reviewed the STA Adelaide experience of implementing and operating an electronic ticketing system and noted that there are four principal lessons that could carry over to other operators:

(i) Twelve months were needed to bed down the system:

- Some short-term problems can be expected, with the need to fine tune the system during the early months of operation

(ii) Delaying introduction would have cost more:

- Implementation of the system through live pilot testing and staged introduction, while being very desirable, was impractical in the STA's circumstances due to the extent of the changes being introduced. Many problems would still not have surfaced or been resolved until after commissioning.

- Delays would have lost revenue because a fare rise was introduced at the same time (worth $0.30m per month).

(iii) Employee Relations need specific attention:

- Despite the benefits to employees in using the system there were difficulties in obtaining acceptance for it.

- Several wage claims still had to be settled in the period leading up to the launch of the system

(iv) Unanticipated downstream benefits gained:

- The new system has opened up further opportunities for efficiencies and improved service to the public, such as a system to locate vehicles in emergencies, the introduction of automatic ticket vending machines and the opportunity to obtain an expanded database on passenger travel movements.

Conclusions

Guidelines For Introducing ET

The key factors in the successful introduction of an electronic ticketing system are considered to be:

(i) Employee Consultation: Establishment of consultative groups is necessary to address industrial concerns and assess the various technical and operating criteria required of the ticketing system to:

(a) meet the demands of the network; and
(b) the capacity of the organisation to operate it

Formal consultation should be conducted from the outset with employees and their representatives, ie Unions and Industrial Bodies. Formal industrial agreements may be required where new technology results in changes to work practices and responsibilities.

(ii) Training: Over 2,000 personnel (bus drivers, train/tram crews, administration staff) were trained in the operation of the system in the three month period leading up to the launch of the system This is a major logistical exercise, and follow up or refresher training is also necessary because of delays between initial training and use of the system. Sound training is crucial for successful implementation and operation of an electronic ticketing system

(iii) A Co-ordinated Implementation Programme: On letting the contract a scheduled implementation programme was developed. Target dates were established for the testing, delivery and installation of all components Careful management and co-ordination of all implementation activities were necessary to ensure that the system was fully operational on the launch date This date was ultimately fixed three months in advance, to allow for employee training and public relations activities to be conducted. Responsibility and authority for this coordination must be clearly established

(iv)Pilot Testing: Although it would have been desirable to have introduced the electronic ticketing system initially on a trial or pilot basis, and this was considered, the nature of the Adelaide public transport system prevented this. The intermodal character of services involving integration of bus/tram/train, the zone fare structure and ticket transfer arrangements, as well as a decision to increase fares and radically alter ticket types and validity conditions at the same time as the new system, meant that it was not feasible to operate only parts of the system or restrict it to a limited area as a pilot operation Therefore prior to launching the system extensive tests and trials of individual components and particular segments were conducted The whole system came into operation with the first services on Sunday 27 September, 1987.

(v) Effective Public Relations: In the two months leading up to the launch of the system, a public relations campaign was conducted through press, radio and television, to acquaint passengers with the electronic ticketing system. Explanatory pamphlets and brochures were widely distributed. The PR campaign continued on a gradually reducing basis, during the first two months of operation. On the launch date management and staff directly participated in assisting passengers throughout the network Infrequent users, mainly in off peak periods, experienced the most difficulty adjusting to the system. Follow up promotions were targeted specifically at this group Free 'flash' type passes were retained for the visually impaired and a new 'mobility' pass had to be introduced for people with disabilities that prevented their understanding of or use of the system, mainly the intellectually disabled.

(vi) Adequate Contract Documentation: Fundamental performance criteria such as cost/benefits, revenue/patronage data processing capabilities, reliability, ease of operation, fare flexibility advantages etc that can be readily assessed by users and in varying degrees are features common to all ticketing systems need to be established. It is also desirable that:

* at least for the first year of operation, the manufacturer of the system be directly and permanently established in Australia rather than be represented through an agent or some other second party, and be directly responsible for any sub-contract work that may be necessary;
* separate contractual warranties be obtained for each of the hardware, firmware and software components of the system;
* cost options be sought from the supplier for the provision of long term contractual warranties on the system for periods of two or four years or longer,which provides a good indicator as to the level of reliability the supplier places in the system (if sought within the tender process long term warranty costs should be quite competitive and may result in significant savings on in-house maintenance);

* as a protection against early obsolescence, the manufacturer directly guarantee to maintain supplies of all spare parts, consumables and compatible replacement items throughout the nominated life of the system;

* for at least the first 12 months of operation, the manufacturer be responsible for the procurement and use of all tickets and cards to avoid conflicts arising between different suppliers as to the source of faults.

Mellor (1985) has reviewed the experiences and views of operators and local authorities in the UK in the use of AFC systems with particular reference to administrative issues eg staffing, training, suitability of equipment etc.

New Technology - New Approaches

Advances in microprocessor technology will be the key to many of the future developments and advances in electronic ticketing. Future trends may be considered from a review of the various elements that comprise a ticketing system.

(i) Readable Tickets and Cards: In most systems magnetically encoded tickets and cards are superseding the earlier bar code/optical reader systems and appear destined to be dominant in most electronic ticketing systems in the future.

The personal 'stored value/credit file' Smart Card (ie a plastic credit card containing an embedded mirochip) is now being progressively (although selectively) introduced throughout the community by the major banks and credit institutions. It could be several years however before these cards are in widespread use. The important pioneering pilot projects in the use of Smart Cards on urban transport were conducted in France ie Blois RATP in 1986, Valenciennes 1988 etc. A major conclusion was that Smart Cards could be used effectively in urban transport only as a prepayment or 'decremental' card (refer RTAC Project No.136 pp 37-40 and appendix C). At present the post payment or credit file card as issued by banks, when used on-board a vehicle still has a number of logistic problems such as credit verification, use of PIN, security etc, although of course this type of card is ideal for transacting ticket sales off-board at fixed sites.

Certainly Smart Card is rapidly evolving as the international medium for cash-less transactions and could ultimately be forced on public transport from central financial organisations.

Standards for magnetic tickets and cards have been or are being developed by a number of countries ie Japan, Britain, Holland. Australia may need to adopt similar uniform standards for the use of magnetic tickets and passes on transport.

(ii) Software: Ticketing systems have two distinct software components:

(a) On-board Software: This software largely determines the limitations of an electronic ticketing system through its capacity to collect and store data.

(b) Off-board Software: Generally off-board software application programmes can be readily developed to process ticketing system data. Usually such software requires some customisation to meet the specific needs of individual networks. The major issues for software are those of integration with other related systems and flexibility to allow organisations to make changes easily.

In the future, electronically erasable programmable memory chips (EEPROMs) in on-board equipment and high capacity solid state memory cassettes will have greatly expanded data capture and storage capabilities. This will allow further automation of operator functions, for example the presentation of 'timetable instructions' for the operator to follow and automatic updating of various on-vehicle equipment. Other additional information that could be processed from an expanded data base would include passenger travel patterns, loadings and alightings, equipment/vehicle performance monitoring (faults/diagnostics), fuel monitoring/control, and route operating characteristics (dwell times etc).

(iii)Equipment and Hardware: Ticketing equipment must stand up to fairly heavy use. In general existing equipment is quite adequate in meeting the main functional requirements eg ease of use by passengers, security and resistance to misuse, accessibility for maintenance etc. In future more attention will no doubt be given to ergonomic design with particular relevance to the ergonomics and use of portable ticket selling units and the equipment used by bus drivers in having to transact ticket sales. New technology will permit weight reductions.

Further technical improvements in ticketing equipment and hardware can be anticipated from:

* use of stronger, lighter weight materials resulting in more compact durable equipment;
* miniaturisation of microcircuitry that will be more power efficient

An integrated approach to the use of on-board electronic equipment, including ticketing system components, is important to ensure their proper interfacing. This will avoid future proliferations of a range of electronic componentry with associated complex operational and maintenance procedures.

iv) Communications: The use of infra-red data links or digital data communications over a vehicle radio system have potential to control ticket validity on-board vehicles and to retrieve ridership data and statistics from the system with reduced operator involvement

Future Direction

In Australia at the moment most networks have either introduced new ticketing systems or are in the process of doing so.

Faced with a wide, and somewhat confusing array of electronic ticketing system designs, there advantages in developing a common strategy as regards the choice and use of ticketing equipment to provide significant benefits arising from economies of scale in purchasing equipment, and the avoidance of duplicated effort such as in the planning and preparation of documentation.

In this context public transport operators could consider the following measures:

* adopting common standards for ticketing systems in Australia, and in particular for the type(s) of tickets used (Canada is presently doing this through CUTA, the Canadian Urban Transit Association, refer RTAC Project No 136);
* introducing formal methods for exchanges of information between networks on the technical and operational aspects of ticketing systems;
* joint development of specifications and guide-lines for choosing equipment

Friend or Foe?

ET has arrived!

Not quite in the guise of the alien, somewhat beguiling creature of Steven Spielberg fame - although some striking similarities can be perceived.

To the uninitiated ET can present a somewhat forbidding exterior, if neglected or misused ET can be decidedly unfriendly and unco-operative. It has the capacity to be a powerful friend or a formidable foe. However, if approached carefully, and with an understanding of its unique characteristics, then ET will prove a very worthwhile ally in the quest for greater efficiency and better customer service.

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