

THE IMPACTS OF CORPORATISATION AND DEREGULATION OF INLAND  
TRANSPORT ON ENGINEERING MAINTENANCE OF NEW ZEALAND RAILWAYS

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**ABSTRACT:**

*Less than two years after it was reconstituted as a Government Corporation in 1982, New Zealand Railways began to lose the competitive protection it had enjoyed for many decades. As the inland freight industry was progressively deregulated, fierce competition drove prices down to low levels which compounded the problems of restructuring NZR to make it profitable. Because maintenance of the fixed and moving assets is a substantial proportion of NZR total expenditure, it became essential to achieve large reductions in engineering costs. Yet acceptable standards of safety and utility had to be preserved. The difficulties were increased because at the same time, construction works were in hand for electrification of a 400 km section of the North Island Main Trunk Railway.*

*The paper explains how the problems of reducing maintenance costs were addressed, and reports progress in the first six years of the Corporation's existence. Although costs and the labour force have been halved, further reductions are required before the goal of profitability can be achieved.*

INTRODUCTION.

The New Zealand Railways (NZR) system comprises some 4300 route kilometres of narrow gauge track, mostly single line, serving the cities and principal towns of the North and South Islands. Between the islands NZR operates a fleet of three ferries carrying rail, road vehicle and passenger traffics. The loading gauge of the system is constrained by many small section tunnels, driven through the mountainous countryside at the time the lines were built. In the year ending March 1988 the railway carried some 8.8 million tonnes of freight, 800,000 long distance and 16 million suburban rail passengers. NZR also operates long distance passenger and some suburban passenger bus services.

To the engineering staff of NZR, the most immediate effects of the change to a Corporate form of organization, and of the deregulation of inland transport, were substantial reductions in the financial allocations for engineering maintenance. In consequence, resources of labour, materials, plant and services have been progressively reduced below traditional levels (and at the time of writing, that process of reduction is still continuing). For a commercially successful Corporation, revenues must not only cover the direct and indirect costs of running the Railway, but also leave sufficient profit to show a reasonable return on the assets employed. But previously, while trading as a Government Department, Railways had rarely earned enough revenue to fully cover its costs. The need to provide a profit margin was the first reason that engineering maintenance budgets were reduced. The second was the need for a further reduction in expenditure when revenues fell after deregulation of inland transport.

Within the engineering Branches the new austerity triggered many changes. Most obvious were revised organization structures, and different practices, procedures and systems. Less visible, but possibly more fundamental, were value changes. The earlier Departmental traditions, stressing technical excellence, began to be replaced by a greater emphasis on commercial and managerial excellence and while the cultural change has already been considerable, the process is probably far from complete. Rapid, sweeping change in an organization is not achieved without financial cost. When that organization has traditions as deeply entrenched as those of the Railway Department, there is also a toll of human costs which cannot be measured in money terms.

The New Zealand Railways Corporation (NZRC) was established on the first day of April, 1982. Prior to the change, Railways had been a Government Department for over one hundred years. The Department had been organized by activities into one operating and two engineering branches, but after becoming a Corporation it was restructured into three separate business groups (responsible for freight, passenger and property). Railfreight Systems (RFS), the new freight business, was the largest, and including the inter-island rail ferries, accounts for about 80% of the Corporation's revenue. Most engineering activities were included in RFS, and their total cost is about half of the RFS operating budget (excluding maintenance and operation of the ferries, which are not covered by this paper). The future profitability of both NZRC and of RFS itself therefore depend substantially on the extent to which engineering maintenance costs can be reduced.

For much of its existence, and virtually all the time it had been subject to real or potential road competition, the Railways Department enjoyed some measure of legislative protection of its monopoly position in the marketplace. But from 1 November 1983, that protection began to be removed. In the case of freight, from which by far the greatest proportion of NZRC revenue is derived, the market became fully deregulated on 1 November 1986. Since 1983, rail freight rates have declined in real terms significantly below their pre-deregulation level. The rates fell despite imposition of substantial weight and distance related road user charges which sought to recover from road transport operators the full costs imposed by their heavy vehicles.

Even though funds currently available for engineering maintenance are equivalent to about half the amounts that were considered necessary in Departmental times, they are still much above the levels which Railways can afford if it is to become even marginally profitable. Further reductions, and corresponding productivity improvements, are required. In consequence, preserving acceptable standards of safety and utility, so that Railway passenger and freight operations themselves are not imperilled, has become a most important challenge.

#### THE POTENTIAL FOR MAINTENANCE COST REDUCTION.

The explanation of how a reasonably managed railway could expect to reduce its maintenance resources in the space of a few years to one quarter and still function safely and effectively is to be found in its history. In the late 19th and early 20th centuries, the pioneer lines of NZR were constructed through a difficult landscape at the cheapest possible first cost. The economic growth which the railways encouraged generated new traffic and paid for upgrading of the lines to carry it. The railway in its pioneer days was very self sufficient. Although new lines were constructed for it by the Public Works Department, they were upgraded by Railways own maintenance staff. Most new rolling stock and steam locos were built in NZR workshops. These Government policies of progressive upgrading and self sufficiency were to continue for about one hundred years. When the emerging road transport industry was perceived as a threat to the huge public investment in railways, the further policy of transport protection was added, and it too was to survive for many years.

Despite many branch line closures in the 1950's and 60's, by 1980 NZR had a network of some 4500 route kilometres of track, generally in excellent condition and capable of development to safely carry the greater tonnages, heavier axle loads, and higher speeds that economic forecasters predicted. Further, NZR had the supporting resources to maintain the network and rolling stock and to continue the historical process of upgrading.

But then there were changes in both the economic conditions and in Government policies. Optimistic estimates of economic growth were replaced by pessimism. The long established emphasis on import restrictions and import substitution born from balance of payment concerns were abandoned. In the future, economic allocation decisions were to be determined more by market forces than by direct intervention. Legislative changes, introduced in a comparatively short

time, included abolition of NZR's historic status as a Department and deregulation of the transport industry.

In the early and middle 1980,s the nature of NZR's future role began to emerge. It was to play as large or as small a part in the economy as its competitiveness would permit. Unless the railway become profitable, it would cease to be part of the transport infrastructure, and with a likely reduced future share of a smaller transport market, the need to continue to upgrade the railway for traffic at greater than current levels disappeared. As the first step toward profitability, Railways retained the United States consulting firm of Booz-Allen and Hamilton Inc to report on NZR as they found it and to formulate strategic options appropriate to the new circumstances. The outcome was the Booz-Allen Report of November 1983 from which Railways developed their Repositioning Plan. That Plan included confirmation of the 1981 decision to proceed with electrification of the North Island Main Trunk Railway (NIMT).

For the engineering maintenance activities of Railways, Booz-Allen identified the potential to reduce resources (including staff) from their historical levels to standards more consistent with those typical on North American railroads. In particular, the reductions could be made by :

1. closer matching of work efforts to the current business requirements
2. improving productivity in the workshops and other maintenance activities
3. selective investment in productivity enhancing projects, especially better wagons, stronger drawgear, automatic couplers, and consolidation and modernization of the workshops.

In Booz-Allens view, there was potential to reduce the Mechanical Branch expenditure by 42%, and staff by 47%. For the Way and Works Branch the expenditure reduction was to be 33% and the staff reduction 36%. Reductions were calculated from 1983 expenditure and staff levels, which were fairly typical of levels in the previous decade. NZR could not only dispense with its traditional upgrading resources, it could also secure a return on past upgrading investment through lower future maintenance costs.

#### THE REPOSITIONING PLAN.

The object of the Plan was to restructure Railways into a more efficient, market driven, commercially competitive enterprise, making profits appropriate to the capital assets employed. Its basis was a selection of alternatives from Booz-Allen's strategic options, with a time span of five years for implementation. Implicit in the Plan was a systems approach to operation of the railway. Three centrally managed business groups were to be formed to exploit Railways advantages of size and national coverage. They were to use modern communications and data processing technology to permit decisions with a high degree of coordination and discipline. Marketing and operations were to be more

closely integrated, capital equipment used more intensively, and other resources more efficiently.

For the engineering Branches (as they then were), the plan contained targets for resource reductions but no specific measures to achieve them. Instead it had proposals for a series of studies, 11 for the Mechanical Branch, and 6 for the Way and Works Branch, intended to identify the means of rationalizing their activities. The studies, to be carried out by NZR staff, were designed to:-

1. In conjunction with the marketing and operating Branches, reduce the inventory of fixed and moving assets to the minimum commercially acceptable.
2. Define standards of asset condition that were sufficient, but did not exceed, those necessary to provide commercially acceptable utility and reliability.
3. Introduce maintenance management systems, supported by management information systems, that eliminated non-essential maintenance and programmed essential maintenance in priority order.
4. Continue and extend wherever cost justified contracting out of the supply and maintenance of facilities and equipment.
5. With industrial engineering techniques, improve the methods by which the remaining work was carried out.
6. Use Quality Assurance and Risk Management techniques to ensure that standards of reliability and safety were maintained.
7. Rationalize the existing maintenance facilities to match the real workload and release under-utilized property in commercially valuable locations.

With appropriate changes of detail and emphasis, these principles were incorporated into the planning of the engineering Branches, and later, the engineering Divisions.

Implementation of the Plan included the progressive reduction of staff ceilings and maintenance budget allocations. The loss of resources has been compensated by reductions in workload (especially from the lower traffic level), cancelled upgrading policies, reduced asset inventories, and improved productivity. To date safety performance has been sustained and there has been some overall improvement in utility. However the utility increases have been largely due to investment in works associated with NIMT Electrification, from the continued replacement of old, lighter rail and from the introduction of some new rolling stock.

There has been substantial progress with reorganization. The original Mechanical Branch, with four Districts, and Way and Works Branch with six, were restructured into eight (now seven) Divisions, each with three Regions. Where the Branches had responsibility for either the fixed or the moving assets, the new Divisions became responsible for specific categories of asset (eg. track or wagons). The intention was to focus management attention more closely on the assets themselves rather than on the activities that looked after them. Each Division has a similar flat organization structure, to help centralized management of its activities. One further Division, formed from the previous Purchasing and Supply Branch, was included with the engineering Divisions as its principal function was the supply of engineering stores. Firm appointments have been made to virtually all new positions.

The new organization, like its Marketing and Operations counterpart, required new management and information systems. NZR may in the 1960's have been a leader in the application of electronic data processing (EDP) to business activities but 20 years later those systems, still in use, were obsolete and inappropriate. Improved systems and increased EDP capability were among the most pressing needs identified by the Booz-Allen study. However the design of new systems and purchase of software and processing capacity at a time of uncertainty and structural change was a problem. Only recently has it been possible to define future needs with sufficient confidence to justify the investment required. While a new mainframe computer has now been obtained it will still be some time before all new systems are in place.

Consolidation and modernization of the workshops presented special problems. At the height of their activity in the 1940's the workshops employed about 7500 staff at five main locations. Even though by 1983 staff numbers were much reduced, the land, buildings and equipment from the peak years during World War 2 were still substantially intact. Workshops capacity was far in excess of the reduced requirements following deregulation. In 1986 East Town workshops at Wanganui were closed. Staff levels at Otahuhu, Hutt, Addington and Hillside are now well below the 1983 levels, but their total is still above projected future requirements. Many buildings are empty, and much plant and equipment is surplus or has been disposed of. Decisions on the future of the workshops are expected to be announced about July of this year.

As mechanization progressively replaced manual methods, track maintenance staff numbers prior to 1983 had been steadily declining. Traditionally, track work on railways is divided into separate maintenance and material renewal activities but in the 1960's NZR had combined them and redivided the workload between about 100 amalgamated gangs, supplemented by some mechanized surfacing gangs. In 1986/87 the amalgamated gangs were reorganized back into some 108 small length gangs and 35 larger heavy maintenance and renewal gangs. The reorganization will not only permit the future mechanization of more tasks but allowed reallocation of safety responsibilities in a form more compatible with centrally programmed work schedules.

Confirmation of the 1981 decision to electrify a 400 km section of the NIMT created a second major demand on engineering management resources

during the course of the Repositioning Plan. As well as supervision of the main contracts for locomotives, traction overhead, signalling and communications, the project required a large volume of work by NZR's own staff, consultants, and supplementary contractors. Upgrading the route was a major task. It included curve and grade easements, line deviations, new and strengthened viaducts and bridges, tunnel works, and improvements to track both in main lines and in yards. Together the electrification projects will increase the capacity of the NIMT and significantly reduce transit times, improving the RFS competitive position. But it created a workload peak in the central North Island at a time that staff numbers were being reduced in other places, and at the end of the job, aggravated the staff reduction problem.

The Repositioning Plan called for resource reductions to take place within a five year time frame. After the first four years, better than 80% of the total cost reductions have been achieved, and over 100% of the total staff reductions. Yet the target of profitability for Railfreight Systems is still distant. Deregulation and an adverse economic environment have had a bigger impact than was expected.

Booz-Allen predicted that following deregulation, Railways could expect to lose 15% of its tonnage, 18% of net tonne kilometres and 25% of revenues, which implies real rate reductions of some 9%. Four years after the predictions, and about one full year after deregulation was fully implemented, tonnage had fallen somewhat more, net tonne kilometres somewhat less, but both rates and revenue were considerably lower. The freight market was responding not only to deregulation but to other changes in the economy.

By mid 1986, it had become clear that despite the benefits of NIMT electrification and possible Government financial restructuring of Railways, the Repositioning Plan was not going to be sufficient to bring RFS to profitability.

#### THE CORE NETWORK STUDY.

To help define a strategy appropriate to the changed circumstances, Booz-Allen were once again retained to make a further study, with two components. One was to be a reappraisal of the network, to ensure that all lines were making a positive contribution. The second was a zero-based budgeting exercise to confirm the potential for profitability and to indicate future resource levels. Within the limits of revenue predictability in such a dynamic market situation, the studies confirmed that the present network was of optimum size and that it was potentially viable. However further significant reductions in engineering maintenance resource would be required.

The Repositioning Plan studies identified scope for productivity improvement considerably greater in extent than had been achieved up to the time of the Core Network study. To help achieve these cost saving in the shortest time,

RFS retained the services of further consultants experienced in practical railway engineering. These consultants worked with engineering managers to develop cost reduction proposals, which are intended to retain traditional safety standards and enhance present reliability and availability performance.

No formal plan was prepared to replace or extend the original Repositioning Plan. The current business planning procedures of RFS now include sufficient strategic and tactical content to maintain the direction and momentum of the processes of change.

SOME CONCEPTS AND ISSUES.

It is perhaps remarkable that although the engineering staff of RFS have been halved in a period of six years, and the intention to make further reductions is widely known, to date there have been virtually no industrial stoppages nor losses of production through industrial action. That cannot be explained in terms of timidity or apathy in the Railway service organizations. To the contrary, they are effective, energetically led and have a long history of using industrial action to support their viewpoint. The most probable explanation for the restraint exercised by both unions and management is that the situation was well understood to be of critical importance to the future, not to say survival, of NZR. The sweeping changes within Railways have a context of even greater change in the social, political, industrial and economic life of the nation. To the extent that the need for change has been perceived and accepted by the Railway unions, and that their activities have been directed to influencing the nature of the change rather than trying to prevent it, they must be given considerable credit.

The environment for change at a political level was initially established in 1984, when the newly elected Government held a Summit Conference in the Beehive which included representatives of Railway staff at all levels, unions, Railway users, and the wider community. The principal conclusion of the Summit was the importance in the change process of communication, and in general it does seem that where communications were better, the changes have gone more smoothly. That is also true where time has allowed a fuller consultation. In Railways present financial position, with a pressing need to accelerate the rate of change, there is an even greater challenge to complete the restructuring without a destructive confrontation.

Within New Zealand industry, the importance of a strong management emphasis on product and service quality seems to be more generally recognized. NZR could also benefit from quality improvement. Systematic application of Quality Assurance (QA) is possible in each of the marketing, operating and engineering fields, and the level of commitment at all management levels is rising. Many traditional railway engineering activities such as inspection and meeting standards of availability and reliability can be developed into a comprehensive QA programme. However the application of QA to one particular aspect of service quality, that of transportation safety, is fraught with philosophical difficulties.

Railway transportation has its own inherent hazards, which technology and good management can reduce, but never entirely eliminate. But that is common to many industrial activities such as nuclear power generation, food processing, chemical manufacture, aerospace travel and petroleum refining. In postwar years the systematic recognition of hazards in many different fields, and the application of rational techniques to reduce and control them have developed into the

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techniques of Risk Management. They are as appropriate to the risks of railway transportation as to any other hazardous but otherwise worthwhile activity. As NZR seeks to reduce its maintenance costs, the potential benefits of Risk Management are attractive. But one particular difficulty in adoption of the Risk Management principles is in the allocation of responsibility for the explicit decisions that are an essential part of the procedures.

Because the inherent risks of railway transportation can never be entirely eliminated it is inevitable that from time to time there will be accidents. In classical economic theory, the optimum standard of safety occurs when the marginal cost of accidents equals the marginal cost of preventing them. If that argument was strictly applied and the practical problems of determining the probability of accidents and predicting their outcomes were overcome, railway managers could set rational safety standards for all categories of hazards. But traditionally, accidents are often regarded by society as the consequence of negligence. Unless the cause of a particular accident was accepted as unforeseeable, railway managers are likely to be expected by the Courts to have taken all practicable steps to prevent it. In a hierarchical type of organization the responsibility for that accident would be seen to be shared between individuals at the different management levels. The dilemma that arises is that to set rational safety standards, in which some frequency of accident is deemed to be acceptable, is to risk accusations of negligence when those "acceptable" accidents actually occur.

The share of responsibility for transportation safety carried at each level of the organization of the Railway Department had evolved over many decades. Technical standards and operating procedures had developed, for which individual responsibility was so diluted that it was virtually indefinable. Provided that no-one knowingly reduced the safety standards, and there were sufficient maintenance resources to meet them, then the exposure of managers to the risk of accusations of negligence was minimized. The pitfalls of an unwanted increase in personal responsibility as a consequence of changes to the traditional organization of or technical standards were well understood, and reinforced the resistance to change that was so deeply embedded in the Departmental culture.

Following deregulation and corporatization, when maintenance resource levels were drastically and rapidly reduced, and the organization restructured, the traditional basis of safety responsibility was destroyed. At the time of writing the old order is still being replaced by a new understanding of the role of managers, at different organizational levels, in the setting and achievement of transportation safety standards. Helped by consultants, NZR is developing new principles for the management of transportation risk. But regardless of the rationality of that philosophic approach, the logic of the internal division of responsibility, or the degree of external economic pressure, public expectations are that the frequency of serious accidents should generally fall, and their consequences should over time diminish. So questions of the public oversight of railway safety performance arise - who has that responsibility and what should be the criteria of acceptable performance?

As a Department of State, NZR had developed its own safety standards and internally monitored its own performance, for which it was accountable to the Minister. Public viewpoints were introduced through the Boards of Enquiry set up by the Minister, under provisions of the Railways Act, whenever there was an accident sufficiently severe in consequences to attract public attention. That model was carried forward into the legislation under which the Railways Corporation was set up in 1982. But as Railways develops further from the status of a State Department towards that of a commercial enterprise, with the possibility of at some future time becoming a limited liability company, it becomes arguable whether or not those procedures remain the most appropriate. The example common to the newly formed State Owned Enterprises is for oversight of their activities to be separately exercised by one of the remaining Ministries or Departments. Whether or not that would be appropriate for New Zealand Railways Company Ltd. is an issue that has yet to be determined.

#### CONCLUSIONS.

As their contribution to the Repositioning plan, the engineering Branches/Divisions of Railways have in a five year span trimmed their costs by some 40% and their staff by 50%. However that improvement is insufficient, and considerable further reductions are required. The means by which the reductions can be accomplished, and the scope for the necessary improvements have been identified; it remains to actually make the reductions.

The ultimate outcome of the efforts of the Railway Corporation to reposition itself in the marketplace is likely to be determined by three main factors. One is the continued willingness of the Railway staff and unions to cooperate in the restructuring process. The market is unlikely to tolerate a protracted struggle within Railways and clients would simply divert their business elsewhere. A second is the economic environment. For any given size of railway network and volume of traffic there is a minimum required level of revenue to meet the fixed and variable costs, which can only be reduced within practical limits. If the size of the market, or the prevailing rates, fall below threshold levels, then the railway will cease to be viable. Finally there is the ability of Railway managers to reach the standards of excellence necessary for services to be adequately marketed, productivity sufficiently raised, and costs effectively contained, to reach the very challenging business plan targets. Predictions of the likely future of Railways depend on the degree of optimism or pessimism when these factors are assessed.

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#### REFERENCES.

McKenzie P.J. (1984) Transport Regulation and Legislative Control; the New Zealand Experience. Australian Bureau of Transport Economics publication.

JONES

McQueen A.E. (1987) Deregulation and the Railways. Address to Annual Conference, Chartered Institute of Transport, Wellington, November 1987.

Booz-Allen and Hamilton Inc. (1983) Comprehensive review of Operations and Strategic Options Evaluation; New Zealand Railways Corporation, November 1983.

New Zealand Railways Corporation Act 1981. No.119