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SELF RELIANCE BY COMMERCIALISATION - A REVOLUTION IN NAVAL ENGINEERING MANAGEMENT

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Self Reliance By Commercialisation - A Revolution In Naval Engineering Management

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SUMMARY

The New Zealand Defence Force has been faced by a requirement to reduce operating costs and improve efficiency. A changing operational environment has also led to a need for the Royal New Zealand navy to improve its self reliance. Commercial management methods and commercial technology have been adopted to enhance the technical capability of the RNZN and minimise operating costs.

INTRODUCTION

With a fleet strength of 4 frigates and 3 major auxiliary vessels, the Royal New Zealand Navy is one of the smaller navies of the western alliance. At present the personnel strength of the RNZN is approximately 2,000 officers and men, supplemented by a civilian workforce of about 560. This small force, like allied navies, has been required to downsize in recent years as politicians and the public have sought a peace dividend. The RNZN, again like allied naval forces, has been forced to introduce commercial management to achieve optimum use of resources. However, in the case of the RNZN the drive to reduce costs and improve efficiency has coincided with a period in which the Navy has also had to develop a high degree of self reliance. Engineering elements of the RNZN have led several sectors of the commercialisation process and have been strongly affected by others. This paper outlines the changes and their effect on RNZN maintenance engineering support.

DEFENCE POLICY

At present there is widespread acknowledgment that there is no direct territorial threat to New Zealand (1). The primary concern of the NZDF is therefore seen to be the need to defend New Zealand's wider interests. Current Defence Policy is based on the precept of self-reliance in partnership. Defence is provided with the resources needed to achieve a credible minimum capability. Minimum arises from the need for the Force to be fiscally sustainable, while credibility is to be achieved by reassuring New Zealand's neighbours and allies that the Government has the resolve and capability to meet the aims defined by successive Governments.

PUBLIC SECTOR REFORMS

A series of economic crises in the late 1970's and early 1980's, forced New Zealand to embark on a series of major reforms of the public sector. The primary aim of these changes

was to reduce foreign debt but they included major alteration to the structure and operation of the public service. Reform has been based on five key principles:

1. Policy and advisory roles must be separated from administration and operation.

2. Departmental objectives are to be clearly stated to define roles and objectives.

3. Accountability is to be maintained.

4. There should be competitive neutrality. As much of supply as possible should be placed on a commercial basis.

5. Managers should be allowed to manage.

A major review of defence resource management in 1987 paved the way to the restructuring of the Defence Department (2). Reform actions started shortly afterwards: Defence was split into two, policy and advisory roles were taken over by the Ministry of Defence while military operations were placed in the hands of the New Zealand Defence Force (NZDF). Defence outputs have now been defined in terms of quasi-commercial deliverables and the Chief of Defence Force is accountable for meeting these requirements (3). A number of areas of defence activity have been fully commercialised - for example in 1994, management of the naval Dockyard facility was handed over to a consortium of New Zealand and overseas companies.

EVOLUTION OF NAVAL ENGINEERING CAPABILITIES

In the period from WWII to 1984, New Zealand naval operations were tightly intermeshed with those of the US, UK and Australia. Wartime links with the USN were cemented in 1952 when the ANZUS military alliance was signed. This connection provided the core of the strategy which defined the subsequent development of the RNZN's primary capabilities. In the late 1950's the RNZN began the move away from the quantitative capacity offered by a fleet consisting of 3 cruisers and 6 frigates. Instead, the Navy sought improved quality provided by a smaller force consisting of 4 frigates optimised for anti-submarine warfare (4). Two modified Rothesay Class frigates were delivered from the UK in 1960/61 and by 1971 the flotilla had been completed with the addition of two Leander Class frigates. The role of the force was primarily to provide convoy and battle group protection although naval gunnery capabilities were also maintained. Frequent exercises with the US and other navies maintained the skills required to operate in multinational naval operations

These operational connections to the US contrasted to the RNZN's technical background. From its birth until the mid-1970's, the engineering branches of the RNZN effectively operated as remote sectors of the Royal Navy engineering organisation. Most ships and the majority of their equipment were acquired from the UK although Australia provided some products. Maintenance consumables such as paint and lubricants also came from UK sources. Refits and routine engineering activities were carried out in the Devonport (Auckland) Dockyard which was operated on the lines of a UK Naval Dockyard.

Local technical decisions were made by engineering personnel trained in the UK and when unexpected structural or propulsion problems occurred, advice was sought from Admiralty specialists located at Bath or elsewhere in the UK. The communication systems of the time

meant that this approach was slow and difficult and moves were made to increase local levels of self reliance. Specifications for the pair of Rothesay Class frigates were different from similar ships in RN service. The break with RN standards represented the first steps towards greater technical independence. Increased engineering self sufficiency was also driven by the need for a sharp increase in local engineering support. Moves were made to develop New Zealand solutions to hull corrosion and component replacement problems. At the suggestion of the RN, a materials function was added to the Naval Research Laboratory. Hull corrosion problems led to the use solid state electronics in a locally designed impressed current cathodic protection system. This development led in turn to trials with coal tar epoxies and other high performance anti-corrosion coatings to make best use of ICCP. Parallel development of manufacturing methods for critical spare components led to significant investment in the Dockyard foundry. The facility was upgraded to enable it to produce high quality corrosion resistant castings and steam system components at short notice.

The four frigates provided the basis for a well established refit cycle driven by requirements for planned preventative maintenance. At any given time, one of the ships was in major refit, two were operational and the fourth was either in post-refit workup or in a maintenance period. After initial teething problems the fleet settled into a routine of reliable operations. Regular refit and repair activity provided a steady flow of work for the Dockyard. However, the cost of maintaining the Rothesay frigates started to rise rapidly as they neared the end of their design life. Various options for ship refurbishment or replacement were explored including removal of the steam turbine plant from one of the ships and its replacement with a gas turbine system. Concerns about the cost and risk of the latter initiative led to it being abandoned when the Royal Navy agreed to transfer two RN Leanders to the RNZN. One of these ships, an IKARA Class vessel, was refitted in the UK. Its arrival served to introduce the RNZN to the demands of operational software maintenance. The second RN Leander was given an extensive modernisation in the Auckland Dockyard.

At about this time, New Zealand entered the phase which culminated in its effective detachment from the ANZUS alliance. Operational contacts with the USN ceased. Links with the RN also began to run down, the process being accelerated by the UK economic reforms which led to the imposition of full market charges for naval personnel training at UK establishments. The trans-Tasman working relationship was strengthened and moves were made to develop closer defence relations (CDR) between New Zealand and Australia. CDR not only encouraged stronger operational links but also emphasized cooperative equipment acquisition. Despite some public opposition, the New Zealand government made the decision to join the ANZAC ship construction program with Australia.

DOCKYARD COMMERCIALISATION

Leander Class frigates were designed for cold war operations: they are optimised for performance but in economic terms are not particularly efficient. Their steam turbine propulsion system requires frequent maintenance to ensure reliability in service. Their hulls are reasonably damage tolerant but their use of evaporators for fresh water production, together with wet bilges, makes for considerable internal corrosion problems in service. RNZN Leanders have not been plagued by the structural defects experienced by their sister ships in the North Atlantic but they have still been expensive to operate, requiring a substantial support organisation. As indicated earlier, the Dockyard had to be progressively expanded as the aging fleet required more and more refit effort.

The RNZN decision to acquire ANZAC frigates signaled an impending crisis for the Dockyard. Replacement of the maintenance-intensive Leanders by ANZAC ships, fitted with commercially-supported diesel and gas turbine engines, palletised systems and digital electronics, was predicted to dramatically reduce the requirement for refit work. Despite the predicted reduced workload the Dockyard would still have to be maintained to provide the necessary engineering support. Initial attempts were made to run the facility on a commercial basis and to attract non-defence work. A number of workplace reforms were undertaken, for example the number of labour unions was reduced from thirteen to two and there was an initial reduction in personnel numbers.

Some commercial work was obtained but a number of factors prevented the early commercial operation from being truly successful. Chief among these were restrictions preventing public sector organizations from borrowing money or making commitments exposing the Crown to financial risk. As a result, the decision was made to hand over the Dockyard to a commercial manager for an initial period of 10 years. The management change took place on August 1, 1994 (5).

The various stages of the commercialisation process have not been without pain. From a peak workforce of over 1020 in 1989, personnel numbers had declined to 780 in 1994 and to 450 in 1997. Specialised industrial facilities such as the dockyard foundry have been closed down and under-utilised plant has been sold off.

Commercial changes have also affected the RNZN itself. The days of the easygoing relationship between the Navy and the Dockyard have gone. A new organisation, the RNZN Fleet Repair Group, has been set up as the project management interface between the navy and the Dockyard. Tasks are now carried out as defined and costed projects and their completion is expected on time and on budget.

Commercial discipline has worked both ways, Dockyard and Naval personnel have both become more focused on financial issues and more conscious about the need for tighter project management and unambiguous task descriptions. As Dockyard staff numbers have shrunk, external contractors have been used increasingly for a wide range of tasks. Naval engineers have become used to the idea of having lawyers routinely involved in contract negotiation and dispute resolution. Greater attention to quality matters has led to widespread adoption of ISO 9000 procedures.

Commercial processes and materials are being used increasingly in place of defence specification products. In many cases major cost savings have proved to be available from use of commercial off the shelf (COTS) technology. For example in the late 1980's when the RNZN acquired a fleet tanker, the vessel was built by a Korean shipyard instead of an accepted naval shipbuilder. The design of the tanker was based on a line of standard commercial vessels modified to meet specific RNZN requirements. The ship cost was substantially less than for an equivalent defence-specification vessel but HMNZS ENDEAVOUR quickly proved to be a critical element of the RNZN fleet.

Paint and coatings provide a more recent case of the use of COTS technology. RNZN engineering materiel authorities have realized that traditional methods of maintaining the paint on its ships are no longer sustainable. Manning levels on ANZAC ships and the auxiliary vessels do not provide the excess personnel resource needed for frequent painting and related maintenance work. Modern surface coating systems are needed to reduce the maintenance burden. Acquisition of military specification paint is not a viable option for an organization as small as the RNZN and the only alternative is for the Navy to use a commercial approach. Paint will be purchased only from companies prepared to stand by their product. The coating will be required to meet a performance requirement rather than a

detailed technical specification. Suppliers will be expected to monitor the paint application process to ensure that the coating is applied correctly. Manufacturers will be held accountable if their products fail to meet agreed performance standards.

INDUSTRIAL INVOLVEMENT

In the meantime, New Zealand industry has been heavily involved in the ANZAC ship construction program. Unlike other Western countries, New Zealand has had a very small defence manufacturing base and when NZ involvement in the project was initially considered there was some concern about the ability of local industry to participate effectively in the construction of a modern warship. To their own surprise, a number of manufacturers found that they were fully competitive and once they understood the complexities of the performance certification process, they were able to produce a considerable range of products for the project. At present New Zealand industry has attracted orders worth more than $500 million out of an expected $800 million share of the total value of the ANZAC ship program.

An important benefit of this involvement is that industry can take a more active part in the maintenance of warship systems than in the past. For example, air conditioning systems on the ANZAC ship are fully containerized. The units can therefore removed from the ship and sent to a contractor for overhaul. The Dockyard will not have to maintain a large and expensive air-conditioning refit unit.

The Dockyard is therefore developing two separate sectors. The first concentrates on ship overhaul and repair and treats RNZN ships as just another hull in the mix of military and civilian vessels passing through the drydock. The second, military sector, is concerned with the maintenance of core weapon systems which require specialist knowledge for repair and overhaul.

TECHNOLOGY SUPPORT AND DEVELOPMENT

RNZN requirements for technical support have changed as commercialisation has evolved. Many technical solutions are now obtained from local suppliers of commercial products and services. The technology is often state of the art and highly effective. Its availability represents a key element of RNZN technical self reliance. However, RNZN maintenance engineers sometimes face major difficulties in selecting an appropriate and effective solution from the huge range of available product options. Design requirements represented by military specifications therefore have to be translated into commercial terms and the performance of products on offer has to be assessed against the need.

Additional technical support is also needed when a commercial product fails to meet capabilities claimed for the product. In the naval environment failures have often occurred because the naval application was more demanding than equivalent civilian applications. For example, major paint companies have become well aware that naval vessels spend more time alongside and that standard commercial antifouling coatings can become inactive under these semi-static flow conditions. Specialised products are required to provide the required antifouling properties. Other suppliers may not know about the problem and may offer the cheaper antifouling coatings which are likely fail in service on a naval ship. In order to avoid deficiencies in operational readiness, the procedure used to acquire critical products such as antifouling paint must therefore be set up to avoid purchasing materiel likely to cause problems in service.

In other situations, commercially supplied products may simply be substandard and litigation may be necessary to obtain appropriate remedies. The legal case can often involve a significant technical component and it is important that the technical argument is adequately prepared, based on high quality information and presented by individuals with appropriate qualifications and experience.

The drive to reduce operating costs has also placed more emphasis on condition-based maintenance rather than on preventative maintenance. Far more attention is consequently being paid to systems monitoring. The RNZN is in the process of developing an in-depth capability for machinery condition assessment using vibration and oil analysis methods. The expected life of the RNZN's ANZAC ships is likely to be over 30 years and since these vessels do not have a structural margin for corrosion, it is important that corrosion and fatigue monitoring programs should also be developed to avoid the requirements for expensive structural repairs.

CONCLUSIONS

Incremental and individually moderate reforms implemented over a number of years have collectively led to a revolution in the way the RNZN operates. From an organization which was formerly highly dependent on overseas support, the Navy has become much more self reliant and increasingly capable of independent operation. The process of change has been associated with the introduction of levels of commercialisation which would have been difficult to imagine a few years ago.

The change process may not be over. Downward pressure on the Defence Budget remains intense and the drive to achieve further efficiencies is as strong as ever.

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