MACHINERY SUPPORT FOR THE FLEET

BY

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The following article is an edited version of a lecture given by the Author on the work being carried out by D.38 Section of the Marine Engineering Directorate of the Ship Department. The Author was from May, 1965 to January 1968, Head of that Section.

'Ours not to reason why,
Ours but to satisfy . . .'

Perhaps this sounds a little pompous, but (with apologies to Alfred, Lord Tennyson) it would be an appropriate slogan for the Section in the Ship Department now specifically charged with the provisioning and control of Depot Spares, and with trying to supply the urgently required bit of spare gear that SPDC does not happen to have in stock.

The terms of reference of Section D.38 were changed in October, 1966. Its previous job had been to look after the steam and COSAG ships from their date of acceptance, and part of this had of course involved providing Depot Spares when catastrophic failures had occurred and trying to find spare gear when SPDC's cupboard was bare for one reason or another; for the COSAG ships in particular, these two functions kept the Section pretty busy, and sometimes at the expense of other work such as processing As and As, S.2022s, and so on.

Partly to improve the hardware support business, especially with refit by replacement in the pipeline, and partly in satisfaction of the philosophy that mistakes made in past ship designs could be better avoided in new ship designs if the building Section were also the running-ship Section, D.38 lost its running ships and it was charged in the first instance with assuming control of all ironmongery at that time controlled by several Sections in the Ship Department. However, after further consideration it was decided that the ordering and allocation of Admiralty Supply Items for As and As and the ordering of the first set of Depot Spares for a new design should remain with the Ship Section concerned.

Thus the following became D.38's responsibilities for hull, engineering and electrical equipments:

(*i*) Making financial provision for and initiating purchase orders for new items—other than the first set; that is, additions to stock because more ships of a Class have been built, or replacements for items which are beyond repair, and then getting them into stock.

(*ii*) Allocating replacement items to satisfy demands.

(*iii*) Ensuring the repair and return to stock of items replaced.

(*iv*) Distributing stocks between the United Kingdom and Singapore and, on a much smaller scale, Bahrein.

(*v*) Trying to satisfy by alternative means demands for spare gear which SPDC is unable to do by target date.

It must be mentioned that the control of self-contained air-conditioning units, water coolers, refrigerated shelves, etc. and laundry machinery remains the responsibility of the Ship Service Machinery Section.

D.38 Section was reconstituted essentially as a support service to the Fleet—its aim is to prevent operational non-availability, and it is therefore handling yesterday's and today's problems, but not tomorrow's; they belong to the Specialist Sections and the Spare Gear Group. It is necessary therefore to be strict in accepting only those tasks directly related to the prime function in order that the Section's existing momentum, geared to the clock, shall not be lost.

It is time to destroy the distinction still drawn by some people between spare machines required as emergency replacements, and those required for overhaul by replacement; the former used to be called, and often still are, List 'D' spares. One part of today's gospel is that all spare machines, or large portions thereof, are called Depot Spares and that these are available for either purpose, although a minimum stock is stated and not reduced except for an emergency requirement; this minimum stock level is rarely more than two, often only one, and with some particular sore thumbs not even achieved at all. By an emergency requirement is meant that a ship is non-operational unless the item is supplied; there is a little grey area that occurs in the last week or two of a refit—a machine failing then may in due course affect the ship's operational availability—and very occasionally, depending on the circumstances, this is classed as an emergency requirement.

The phrase 'overhaul by replacement' was used deliberately—the phrases overhaul, refit and repair by replacement are used rather loosely by many, and misunderstandings can occur. The shades of difference between the three phrases, endorsed some time ago by the Dockyard Ship Repair Policy Committee, are that *overhaul* by replacement is the family name for the use of any new item, whatever its proportion of the whole, in the process of refurbishing. If the proportion of the whole is something less than 100 per cent—for example, the rotating elements are changed—this is *repair* by replacement, but if the proportion is 100 per cent—i.e., the whole machine is changed—then this is *refit* by replacement. In January 1967, Board approval was given for refit by replacement to be planned for and built into new construction surface ships, and for it to be adopted where practicable in existing ships. This problem is well summed up in a quotation from a paper on the policy of Refit by Replacement prepared by Captain Garstin some 3 years ago:

> 'A proper refit by replacement policy will undoubtedly be expensive. It is worth the money if and only if it increases the operational availability of the Fleet, either by shorter refits, or reduced non-operational time in between. If fully implemented, it would require bigger—and therefore more costly—ships for the same military function and, furthermore, it would require both initially and throughout the ships' lives that space that could be used should be left clear for access. This will test us to the limit.'

Apart from building ships so that whole equipments can be reasonably easily and rapidly moved out and in, the basic requirements to support a R by R policy are:

(*i*) To have enough units to meet all requirements

(*ii*) To have them in the right place at the right time

(*iii*) To have a rapid recovery system to repair items for re-issue

(*iv*) To have repaired items returned to the 'as new' state—or as nearly so as practicable.

These are the requirements D.38 Section tries to satisfy.

The stock required to support R by R is dependent on three factors—the quantity of the item in service, its time between overhauls, and the time taken to overhaul the removed item. The simple relationship is that

$$\text{the R} \times \text{R stock required} = \frac{\text{total no. in service}}{\text{time between overhauls (in years)}} \times \text{time taken to overhaul (in years)}$$

subject to this coming out at not less than the maximum number of the item fitted in any one ship. The emergency stock—preferably at least two—must be added to this to get the total stock, unless of course there is only one ship in the Class. The big unknown of these three factors is the time taken to overhaul—not the number of man-hours required, but the actual elapsed time between the machine's removal from the ship and its receipt, as new, into depot. Sometimes this is as much as three or four years. So until this factor can be rationalized, the formula is of little use. In the meantime, the home-made rule used is that in general 25 per cent complete machines are provided and, where appropriate, 25 per cent rotating parts in addition, of the total number fitted. This would in fact conform to a time taken to overhaul of about six months, and this is the turn round time being aimed at.

Meanwhile, there is a very large collection of equipments which have been removed from ships and which await repair; considering engineering Depot Spares alone, the figure averages ten for every 'escort' in commission.

Some relief of this load on the dockyards is provided by arranging repair by contract with the manufacturer, but manufacturers' resources are not unlimited, nor necessarily are firms interested in repair work. Some firms are so fully committed that only very few repair contracts can be placed with them. In general manufacturers prefer to produce new machinery, so any orders for additional machines usually retard progress on repairs.

Three running contracts have so far been negotiated and placed with receptive manufacturers. Besides the aspect of unloading the dockyards, great additional benefits arise from a running contract in that the amount of paperwork in the administrative processing is much reduced, time of the unrepaired item lying idle while individual contract action is taken is therefore virtually eliminated, the repaired item emerges after a limited time in hand, modified up to date, fully tested and guaranteed by the firm to be in working order.

An endeavour being made by the Dockyard Department to improve their system is the investigation of the possibilities of batch or line overhaul methods in dockyards—that is, Yards will be nominated as the repair agent for a type of machine and should thus be able to establish a planned and soundly organized overhaul facility for suitable items. An example of this approach is Blackbrook Farm, which is really part of Portsmouth Dockyard.

These efforts to accelerate the repair service are co-ordinated by a small Working Party on which DGD and M, D of S and DG Ships are represented. It looks for all feasible ways of closing the loop and speeding the flow through it from removal from ship to receipt into depot, and is convinced that a primary requirement is to obtain positive central control of the items concerned. To this end a Depot Spare Transit Store will be allocated at each home dockyard into which all the items will be taken straight from the ship; their receipt into this store will be reported to the Working Party who will then nominate the repair agent, taking into account first whether running contracts or line overhaul arrangements exist and then the available capacity at each of the home Yards and at contractors. If the nominated repair agent happens to be the Yard at which the item is lying, the item will go from the store into the shop of the professional department concerned, and after repair back into the store from whence it will be despatched according to the Working Party's instructions. This transit store will also be the route through which unserviceable items arrive from other Yards for repair, as well as serviceable items allocated from AMD or contractor to ships in that Yard.

It is hoped that the use of these stores will reduce the loss of time—and indeed loss of items complete—that occurs at present because they are left on the jetty, or put away in a professional department's lay apart store, or lost in the corner of one of the shops. It should more readily be possible to monitor the progress of the repairs, and the risk of cannibalization will be reduced.

In passing, it should be mentioned that where quantities and frequency of movement justify, some rather superior new look packing cases of the 'top hat' type are being introduced, designed for particular machines and for easy fork-lifting, slinging, etc. These transit cases will shuttle to and fro and only require to do four journeys before they are achieving savings in costs.

Apart from the sheer lack of availability of replacements, the reason for which has been explained above, and the lack of reliability of many replacements when they have been supplied, two other criticisms are frequently made.

Firstly, that the incoming machine is of a lower modification state than the outgoer; this results to some extent from a past reluctance on the part of dockyards to carry out modifications when refitting a Depot Spare because, before the days of Modifications with a capital M, all such changes were made As and As—and these of course are designated by ship, not equipment; Yards are now incorporating modifications, and when machines are repaired by contract, they are brought fully up to date on approved and agreed modifications. The cost of moving items from depot to manufacturer specifically for modification is not justified unless life or limb are at stake.

The second criticism is of non-interchangeability; the holding down arrangements don't line up, blower trunkings don't meet, and more frequently, pipework doesn't fit. These troubles arise for several reasons of which probably the most common is the slight variation introduced by the shipbuilder or the machinery maker. Efforts are being made to improve this situation in new machinery by demanding demonstration that the unit fits a jig which represents the various terminal points. In retrospect, little is possible; one example of the sort of problem here is the distilling plant combined pumps in the Type 12s; as most readers will know, these are horizontally mounted motors with a pump on each end of the motor shaft, and in the early ships were only drip-proof. The failure rate of the motor stators was high because of humid conditions, splashing and so on, and at some stage DNEE changed to TEFC motors for future construction, but not for A and A action retrospectively; before long, pumps with drip-proof motors were being used to replace those with TEFC motors, and vice versa—whichever was available had to go in—but the TEFC motor is longer than the drip proof, and so new holding-down bolt holes and alterations to pipe terminals are necessary. The next time the pump was changed, perhaps a change back again was necessary. Some ships now carry two sets of elbows so that either motor can be accommodated.

D.38's involvement with spare gear is in fielding the signals that come in from SPDC saying 'Request alternative supply be investigated'. This happens on average about 3 times per day and considering that SPDC receives some 50 urgent demands per day, their rate of inability cannot be considered too bad. Overall, SPDC claims to be able to satisfy some 75 per cent of demands off the shelf, and a further 20 per cent within six months. The value of stock taken into SPDC in the 1966/67 financial year was of the order of £5M, which may give some idea of what it might cost if SPDC were to increase their stock to something nearer a 100 per cent satisfaction ability.

The reasons why items of spare gear are not always available were fully explained by the Superintendent of SPDC in Vol. 17, No. 1 of the *Journal*; the reason why the Ship Department can more often than not find the items when SPDC cannot are two-fold: different ways are employed of approaching the same source, and approaches are made to other sources.

Some demands are not without amusement value. One was for a dozen 'boat oars' but this turned out to be a communicational corruption of 'motors'. One priority signal came from a foreign Navy wanting four open-jawed spanners for an obsolete air compressor. Another, from one of our own ships just two weeks before starting sea trials after $3\frac{1}{2}$ years in a dockyard, demanded a complete boiler set of sprayer carriages to replace missing ones.

It seems clear from opinions expressed by several organizations outside the Ship Department that the merger of the various previous ironmongers within it into one body, giving one rather than multi-point contact, has been justified. And though progress is slow—like the drip wearing away the stone—the Depot Spare situation is certainly better than it would have been under the old system.

The following hints are offered to those readers of this *Journal* who are customers in the interests of easing the machinery support problem to the ultimate benefit of all:

(*i*) If you demand some spare, are told it is not readily available, and so decide to obtain by other means—e.g., beg, borrow, steal, make, etc.—do cancel or reduce the urgency of your demand; the effort being applied to it can then be redeployed on someone else's more pressing demand.

(*ii*) Return unserviceable repairable spare gear to SPDC as quickly as reasonably possible; it can then be repaired.

(*iii*) Give a realistic date by which required on your demand; silent hours' service or special effort is willingly given by all concerned but should not be exploited unnecessarily.

(*iv*) Do quote a second date, where feasible; you might, for example, like to have an item for fitting within a few days, but if it does not arrive in time your next opportunity to fit it will not be for another month. Quote both dates, and be assured that every effort will still be made to meet the earlier one; if not met, appropriate rather than possibly disproportionate effort can be used to supply by the second date rather than as soon as possible.

(*v*) If you are in a position to demand a Depot Spare, be sure you really need it; as intimated at the beginning, no one stops to ask why an item is required (though it is usual to find out afterwards) and much effort and expense can be involved; besides, if urgent, a certain amount of goodwill is relied on, and this can too easily be strangled if, for example, the lorry driver arrives after a night at the wheel to find himself unexpected, or unwanted because the broken one has been repaired.

(*vi*) When you must use signals keep their classification as low as possible so that they can be quoted on the telephone if necessary, and do use the correct DIG to speed their arrival on the right desk.