Chapter Four

PROBLEMS WITH THE CURRENT PRICING SYSTEM

In this chapter, we identify the principal problems attributable to the structure of DLR prices. We first explain how the current price system supports Air Force resource allocation decisions for most reparables while providing incentives for customers to make costly decisions for other reparables. We then discuss why the current structure of prices does not provide a useful view of costs. Finally, we identify the aspects of the current pricing system that can lead to under- or overrecovery of total fund costs.

RESOURCE ALLOCATION DECISIONS

Level of Repair[1]

When the Air Force implemented stock funding for DLRs, it structured prices to encourage wings to repair more of the items they are authorized and equipped to repair rather than sending them to the depot for repair. Part of the rationale for this decision was that wing maintenance personnel needed to meet wartime requirements are underutilized during peacetime. Given this rationale, pushing repair to the local level reduces costs.

There are both short-run and long-run consequences of structuring prices in this way. The current price system has succeeded in dis-

[1]Many items have some repairs that are performed at the intermediate level and other repairs that are performed at the depot level. For simplicity, we will discuss level-of-repair decisions as if all repairs for a given NSN are performed at either the intermediate or depot level.

couraging wings from exchanging items that the wings are authorized and equipped to repair. However, the price system also encourages wings to find alternative sources of repair (local organic or contractor) for items that are supposed to be repaired at the depot level. In the long run, wings have an incentive to resist movement of repair from the local level to the depot level and even to seek authorization and resources to perform additional repairs. Customer commands, in addition to being responsive to wings, also have a financial incentive to resist migration of repair to the depot and to expand local and centralized intermediate repair capabilities.

This bias against depot-level repair is problematic in two circumstances. The first is when the cost of local repair is less than the DLR price but greater than the marginal/variable cost of depot repair. In the short run, wings compare the DLR price with the marginal cost of local repair. If the wing has access to a contractor who can do the repair or the wing itself has the equipment and personnel with the right skills, the marginal cost of local repair will almost always be less than the DLR price because the DLR price includes many costs not related to the rate of repair. However, the marginal cost of depot repair may be less than the marginal cost of local repair. Local repair in these cases would save O&M funds for wings while increasing support costs to the Air Force as a whole.

The Air Force has implemented constraints that are designed to prevent customers from taking actions simply to avoid paying the surcharge. The most significant constraint is that wings and customer commands are not authorized to change the level of repair of an item without the permission of the ALC managing it. To mitigate the incentive problem caused by artificially high prices, a wing/command must demonstrate that the cost of the alternative source of repair is less than the depot repair cost. We spoke to technicians at one base who had tenaciously pursued ALC approval to send a DLR directly to a contractor for repair (instead of going through the supply system) for a price that was the same as the depot repair cost but substantially lower than the exchange price. The ALC turned down the request because it appeared that the wing was simply trying to avoid paying the surcharge. After being turned down for cost reasons, the technicians argued their case based on supportability concerns. Their request was again turned down. This example illustrates

wings' desires to make decisions based on DLR prices and the constraints the Air Force imposes to try to prevent them from doing so.

This depot repair cost criterion would appear to stop customers from making level-of-repair decisions that are costly to the Air Force. Although we have no information on the extent of this activity, we have been told that wings sometimes turn to unauthorized alternative sources of repair on non-safety-of-flight items that are designated to be repaired at depot level, justifying this action as necessary to avoid excessive delays in obtaining serviceable units. In addition to potentially increasing marginal repair costs, this use of unauthorized sources of repair causes loss of information about failure rates and can lead to a loss of configuration control. We do not know whether wings would continue this behavior in the absence of artificially high prices, but the current price system reinforces it.

As we discussed in Chapter Two, job routing SRUs is a way for depot repair personnel to bypass the supply system and thereby avoid paying the surcharge on DLRs needed in repair. The *reported* cost of performing repairs (and, thereby, the depot repair cost) is lowered, making the repair shop appear more efficient. However, this activity results in a loss of information about failure rates because failures of reparable items are recorded only when carcasses are turned in to the supply system. Inaccurate failure rate information can lead to inappropriate decisions about inventories for those NSNs, which can ultimately increase repair times and/or inventory costs rather than decrease them. Although this information problem could be overcome through more sophisticated management systems, there is an additional problem associated with job routing. Because job-routed SRUs are returned to the LRU repair shop, there may be circumstances in which they are diverted from higher-priority use.

In the long run, commands compare total expected expenditures on depot repair with the total cost of local repair capability when deciding whether to agree to move selected repairs to the depot level or to increase local capability. (See case 1 in Appendix B.) Because DLR exchange prices typically exceed the cost of repair at the depot level, commands have no incentive to request reexamination of level-of-repair decisions for NSNs that are currently repaired locally. These decisions should be revisited when the factors underlying the original decisions change significantly, including frequency of repair, de-

pot repair cost and time, transportation cost and time, the cost of inventory to fill the pipeline, and the availability of manpower and other resources at the local level.[2]

The bias against depot-level repair is also problematic when a non-cost consideration, such as configuration control, led to the original decision to repair the item at the depot level. To the extent that commands and wings are driven by financial considerations, their decisions may be inconsistent with these other considerations. Unfortunately, customer recognition of the marginal cost of depot-level repair will not solve these problems.

Customers have incentives to pursue ways to avoid transacting with the fund even if they recognize that many of the costs included in the surcharge will still be incurred and must be recovered regardless. If customers are able to reduce their demand for depot repair services, under current policy the surcharge proportion will be increased for all DLRs, either contemporaneously or through the price stabilization surcharge the following year.[3] Thus, when a single customer reduces his demand, all customers share some portion of the costs that the customer avoided.

Condition of Carcasses

Many unserviceable items can have more than one type of problem or have a problem with varying degrees of severity. Some LRUs contain several SRUs, any number of which may need to be repaired or replaced. Mechanical items (e.g., hydraulic pumps) may need moderate adjustments or extensive repairs.

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[2]New Air Force Lean Logistics initiatives are leading to a transportation-based logistics system. In the future, wings may have many fewer supply and maintenance personnel at base level, relying instead on rapid transportation between the deployed unit and a centralized repair facility for resupply of reparable components. (Lieutenant General John Nowak, Air Force Deputy Chief of Staff for Logistics, May 1995, remarks at RAND.)

[3]If the reduction in demand is unanticipated, then costs will be underrecovered during the current year, thereby increasing the price stabilization surcharge the following year. If the reduction is anticipated, the surcharge percentage (multiplied by each item's FAC) will be increased for the current year to avoid underrecovery of costs.

Customers often can influence the condition in which unserviceables arrive at repair facilities. For example, maintenance personnel can control the times between the removal and replacement of mechanical items (assuming they do not affect safety of flight), thereby changing the average repair needs of carcasses. When LRUs have multiple SRUs, customers can consolidate broken SRUs prior to exchanging the LRU carcass for a serviceable one. Also, for items requiring one or more of several possible repairs, customers can select less costly repairs to perform locally and send the rest to the depot.

Under the current DLR price structure, the depot repair cost portion of the exchange price is based on the average repair cost two years earlier and does not depend on the condition of the returned carcass. Thus, if by turning in carcasses in relatively poor condition, customers can reduce the number of exchanged DLRs, they can reduce their current expenditure on DLRs. The total repair cost to the Air Force increases if the higher repair cost per item outweighs the smaller number of repairs (and decreases otherwise).

Wings can worsen the condition of carcasses exchanged for serviceable items by extending time between maintenance of mechanical items. This practice generally leads to more expensive repairs and more condemnations.[4] (See case 5 in Appendix B.) Similarly, wings can consolidate failed SRUs to reduce the number of LRUs they exchange. (See case 4 in Appendix B.) Customers can also save O&M funds on items with distinct repair needs by performing low-cost repairs locally and sending only the expensive repairs (i.e., those repairs that cost more than the DLR exchange price) to the depot level. (See cases 2 and 3 in Appendix B.)

Intermediate-level F-16 avionics screening provides an example of the latter two sources of savings for wings. The first step in the repair of a typical avionics LRU is to screen the box for broken SRUs, electronic cards in this case. The customer is charged the exchange price even if the depot cannot duplicate the failure reported from the field and returns the unit to stock or back to a base. By using avionics in-

[4]There will, of course, be some DLRs that are found not to be degraded by increased use before removal and replacement. Clearly, there can be mistakes in the initial determination of optimal inspection intervals or utilization rates. However, providing incentives to exceed these parameters is not the best way to test their optimality.

termediate test stands, wings can perform the same "cannot duplicate" (CND) screening and exchange only those LRUs found to have broken electronic cards. This screening also provides an opportunity for the wing to consolidate failed cards in a smaller number of LRUs, reducing the total number of LRUs exchanged. The amount the wing saves by screening and consolidating is equal to the sum of the exchange prices of the units it avoids exchanging less the cost of staffing and maintaining the screening equipment. Whether this screening also saves money for the Air Force depends on the tradeoff between the cost of wing-level screening resources (less the reduction in pipeline inventory) and the transportation and depot screening costs.[5] Camm and Shulman (1993) found that CND screening at four bases, each with 72 aircraft, would cost the Air Force approximately $2.7 million per year more than screening only at the depot, because of underutilization of test stands at base level.[6] In spite of evidence that local screening increases Air Force support costs, ACC has chosen to retain avionics test stands in the field because this capability saves command funds.

The wings' incentives to engage in these activities depend on the magnitudes of exchange prices relative to local costs. The lower the exchange prices, the less wings save by extending use of DLRs, consolidating broken SRUs, and sorting between less expensive and more expensive repairs. For example, if avionics DLR prices were set at the cost of depot screening, wings would have little financial incentive to perform CND screening at base level and to consolidate broken SRUs (unless of course the avionics LRUs are in short supply). However, because the depot repair cost is based on historical carcass conditions, to the extent wings do engage in these activities exchange prices will rise to reflect the customer-induced increased repair costs. In turn, these higher prices increase the financial incentives for customers to engage in these activities.

We received mixed information from discussions with Air Force maintenance personnel about their responses to DLR prices. Some maintenance shops remain faithful to Air Force maintenance and supply guidelines for DLRs while others exhibit the behavior dis-

[5]See Chapter Five for a discussion of pipeline inventory.

[6]See Camm and Shulman (1993), p. 7.

cussed here. Unfortunately, we are unaware of any data that can provide information about the extent of these responses to DLR prices. We note only that current prices create incentives for such behavior.

VISIBILITY OF COSTS

The support system incurs many costs in addition to direct repair costs.[7] There are costs associated with the existence of the support system itself (e.g., base operating support for ALCs), maintenance of a weapon system (e.g., system program office staff at ALCs), support of a given NSN (e.g., item managers, equipment specialists), on-demand services offered by the depot (e.g., selected engineering support), and provision of wartime surge capabilities (e.g., equipment and manning beyond peacetime requirements). These costs must be recovered from customers or from direct appropriation.[8]

Support service costs that are not related to the rate of repair are currently included in DLR prices, making the actual costs of individual supply and repair services less visible to customers and other decisionmakers. This arbitrary allocation of support costs is misleading to customers and can result in the provision of services that are valued at less than their costs. DoD recognizes this problem:

> [A] Military Service may be requiring support costs that are not of high priority, but are incurred because the requirer is not required to justify the funding in the budget. The additional costs may also not be visible to either the requirer or the decision makers. (*Defense Management Report Decision*, No. 971, p. 2)

Despite this recognition, the visibility of these support costs remains low.

When a customer requests a budget for DLRs, the customer becomes a de facto advocate for the provision of all the services that are funded by that budget. Thus, covering the costs of support services

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[7]Direct repair costs include direct labor and materials, pipeline inventory costs, transportation costs, and so forth.

[8]When a portion of a working capital fund activity's plant is purposely set aside as idle capacity, a direct appropriation can be requested. (DoD 7000.14-R, p. 65-2.)

by incorporating them in DLR prices causes customers to be the advocates for the *aggregate* level of these services but provides customers with no vehicle to discriminate among them.[9]

The invisibility of these costs to customers raises additional problems on the suppliers' side. First, suppliers are provided with little information about the value of their services and, thereby, about whether the level of these services should be changed. Second, incentives to reduce the costs of providing these services must come from sources other than the reaction of customers to prices.

Allocating the surcharge costs in proportion to the FAC also creates problems for accurately identifying weapon system and command operating and support costs. For example, weapon systems with relatively more avionics bear a disproportionate share of condemnation costs because of the low rate of condemnation and high acquisition costs of avionics equipment. Thus, decisions about changing flying programs or eliminating weapon systems from the active inventory can be skewed by inaccurate estimates of the cost consequences of the alternatives.

RECOVERY OF TOTAL COSTS

The nonzero price stabilization surcharge is evidence that matching costs with revenues is problematic. Some sources of the mismatch between costs and revenues are difficult for the Air Force to control; others stem from the structure of DLR prices and can be avoided.

Demand forecast errors are a source of differences between costs and revenues. Major sources of forecasting errors are "(a) substantial variability in spares demands, even in peacetime (statistical uncertainty), and (b) instability in force structure, force beddown, flying hour programs, funding profiles, item reliabilities, and other item characteristics (state-of-the-world uncertainty)."[10] Depot repair-

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[9]There is a perception that customer commands are more likely to get political backing for support services than is the provider of the support services. It is easier to justify funding support services when the customer demonstrates the importance of the services for combat readiness through willingness to pay for them than when the provider asserts that it is important to provide them.

[10]See Adams, Abell, and Isaacson (1993), p. 1.

related resources (maintenance manpower, equipment, and materiel) must be budgeted for and procured in advance of the demand for these resources.[11] Therefore, it is difficult to avoid over- or underrecovery of costs arising from unanticipated changes in demand.

The current structure of exchange prices can introduce substantial differences between costs and revenues in the presence of demand forecast errors. The costs of operating inventory control points, condemnations, and the previous year's imbalance between revenues and costs are included in the DLR surcharge; therefore, recovery of these costs is dependent on the accuracy of forecasted demands for repair. Costs included in the surcharge are roughly one-half of all the costs that need to be recovered. If demand falls short of (or exceeds) expected levels, then these costs are not fully recovered (or are overrecovered).

The age of the data used for cost estimation is another source of imperfect cost recovery that is difficult to avoid. DoD's budgeting schedule requires that command budgets be constructed well in advance of the execution year. The data used to estimate the depot repair cost portions of exchange prices are based on the resources used in the fiscal year preceding construction of command budgets. Therefore, exchange prices in any year are based on average repair costs from two years before.[12]

Because of this time gap, unanticipated changes in average repair costs can lead to a mismatch between revenues and costs. The prices of material and labor used in the repair process can change as a result of exogenous factors, and the average difficulty of repair can change as a result of customer responses to DLR prices. For example, the recent increase in the number of unserviceable SRUs per F-16 avionics LRU was unanticipated and arose from conscious decisions at wing level to avoid high avionics DLR prices. As a result, the calculated depot repair cost was too low.

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[11]Resources that are readily available in the commercial market need not be procured in advance.

[12]Although the depot repair cost portion of the exchange price is based on repair costs from two years earlier, the price stabilization surcharge reflects over- or underrecovery of costs from the year immediately preceding the execution year.