

R-TOC Pilot Lessons Learned/Best Practices

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CONTENTS

Summary	S-1
R-TOC Lessons Learned/Best Practices	1
R-TOC Funding and Management.....	1
Funding	1
Management.....	6
Reliability and Maintenance Improvements	13
Supply Chain Response Time/Footprint Reduction	14
Competitive Product Support.....	15
Conclusion	17

SUMMARY

The R-TOC program has collected Lessons Learned from each of 30 Pilot Programs and 15 Special Interest Programs (SIPs). These Lessons Learned are a valuable collection of experiences and procedures that have proven successful in reducing Operating & Support (O&S) costs. The Lessons Learned cover a wide variety of activities, from funding and management, reliability and maintenance improvements, supply chain response time/footprint reduction, competitive product support and many other topics.

R-TOC LESSONS LEARNED/BEST PRACTICES

Each of the 30 R-TOC Pilot Programs and 15 Special Interest Programs (SIPs) has made important contributions to the Defense Department's efforts to improve readiness and reduce total ownership costs. Their activities to identify Reliability and Maintenance (R&M) improvements; reduce logistics cycle time; and promote competitive product support can lead to significant ownership cost reductions and readiness improvements.

However, although these Pilot Programs and SIPs are important, their individual activities may not represent the principal benefits of the R-TOC program. Even more important is the potential leverage that the hundreds of other Department of Defense (DoD) programs can achieve by learning from the experiences of these programs. The programs' advocacy for R-TOC within their own organizations builds support for R-TOC throughout DoD. Additionally, as the Pilot Programs and SIPs have gained experience with the identification, implementation, and evaluation of R-TOC investments, their experiences with what works provide important knowledge to help other DoD programs. The Best Practices documented in this guide provide specific examples of R-TOC initiatives that have worked in a specific program and may work in other similar programs.

The documentation of Lessons Learned has been an important objective for R-TOC programs since the beginning of the program. Whereas the Best Practices describe specific initiatives taken by specific R-TOC programs, Lessons Learned represent comments of R-TOC programs about the R-TOC initiative itself: management practices, barriers, enablers, etc.

These Lessons Learned are developed through the quarterly R-TOC Forums and Meetings, where the programs meet to report on their progress and to share lessons learned. In addition, programs are asked to document Lessons Learned in their periodic progress reports. Many of these Lessons Learned represent consensus inputs from a number of R-TOC programs.

R-TOC FUNDING AND MANAGEMENT

Funding

Budgeting for R-TOC. Although R-TOC has been directed at the OSD/Service staff level, the Service requirements and budget processes have the ultimate authority over which R-TOC initiatives will be funded. R-TOC reporting schedules and management processes must be consistent with these Service processes. Without such coordination, many R-TOC initiatives will not be fully implemented.

Although many initiatives have been identified that could lead to significant cost avoidance, O&S cost avoidance cannot be achieved without committing to the initial capital investment required to develop and install those R-TOC initiatives.

Resource support continues to be difficult to obtain, and programmatic fluctuations and variations, although expected, are difficult to plan for, and even more difficult to accept when technology transition efforts are not mainstream to sponsor priorities. Formation of the Navy-Industry Integrated Product Teams (IPTs) for the sole purpose of identifying and conquering those obstacles to acquisition through requirement definition by teaming and risk mitigation has assisted greatly. Simply doing a demonstration of technology is not enough to clear that barrier. The program office actively works to overcome all obstacles in the earliest stage of development (i.e., testing, documentation, design, procedural/policy/guidance change) and couple the technology with Fleet needs to achieve/develop a sound acquisition package and approval for implementation.

R-TOC Funding. There is little direct incentive for the Program Manager (PM) to make Operating and Support (O&S) cost reduction investments a priority: the PM's life cycle management

role will facilitate an affordability approach that balances the interests of Production and Sustainment elements.

An additional lesson learned is that the PM has only a limited ability to directly impact program O&S costs. Due to the fragmented budgeting approach currently employed, the Service headquarters controls manpower funding and billet assignments; another element in the headquarters controls budgets for fuel, depot-level repairables, and consumable materials; another controls training budgets; and the operating headquarters controls budgets for depot maintenance. The PM controls only the budgets for program related logistics and engineering support, retrofit modifications, and technical manuals. These three areas account for an average of only 15 percent of the total fiscal year operating costs. As we previously proposed, allowing the PM to retain some or all of the initial savings generated by proactive initiatives (regardless of the budget from which they originate) and allocate these resources to achieve best value within the program (either to support underfunded areas or as "seed" money to support additional cost savings/avoidance initiatives) is still the best way to incentivize and empower PMs to take a more dynamic role in O&S cost reductions.

While all our R-TOC experiences have been positive so far, it has been frustrating to deal with cost reduction goals that are not viewed as realistic. Due to the luxury of replacing older "tired iron" aircraft with new production units, we have thus far been able to exceed all target goals. Being able to meet these goals does not mean we consider them realistic. We consider it more a serendipitous coincidence associated with the timing of aircraft production schedules.

Another thing that has not gone well is related to the expectations raised at the beginning of the R-TOC program under Program Manager Oversight of Life Cycle Support in 1999. At that time, each Pilot Program was asked to describe initiatives/operating approaches that could be implemented by senior DoD officials to strengthen the ability of PMs to efficiently execute their programs. To date, after over 5 years, none of these Pilot Program initiatives have been implemented. Especially troubling is the fact that the savings from reduced costs are not directed to the PM as an incentive to initiate new initiatives. Such a system could be made self-monitoring in that only actual savings would be passed along and only programs with initiatives would qualify for participation. Without that capability, DoD is asking PMs to invest limited resources in the form of budgeted funding to reward another budgeting entity while tasks for which the PM is responsible may go unfunded. Such a scenario certainly fails to increase the PM's ability to effectively provide oversight to life cycle support.

Budget Stability. Budget stability was identified as a key contributor to meeting R-TOC goals, and the absence of funding stability was identified by program managers as the number one issue preventing accomplishment of R-TOC goals. Funding changes have a double impact: (1) the strongest plan can die in execution because the resources allocated are not available and (2) the management attention required to reclama or develop alternatives detract from improving the well-planned baseline. Savings cannot materialize if adequate and consistent investments are not made.

Variables such as programmatic delays, funding re-allocations, changes to deployment, depot maintenance, or modification/upgrade schedules, etc., all have major impacts upon reaching projected FY05 savings.

Color of Money. The "color" of money is a significant issue in budgeting for R-TOC initiatives. PMs need to access Research and Development (R&D), procurement, and Operations and Maintenance (O&M) funds for R-TOC initiatives. Many R-TOC programs receive funding from a wide variety of funding sources and categories—R&D, procurement, or O&M; annual appropriations; or working capital funds. Each source of funding has its own approval procedures, timing, and restrictions on what it can be used for. These procedures can have a significant influence on the ability of program managers to carry out R-TOC investments.

Delays in Investments. Ongoing budget instability due to congressional reductions in the aviation support equipment procurement investment account continues to erode Total Ownership Cost (TOC) savings / avoidance goals. In addition to causing an increase in program TOC, these reductions

continue to have a negative impact on the fleet sailors' quality of life by forcing the warfighters to operate and maintain obsolete and manpower-intensive legacy systems.

Savings Retention. The removal of anticipated savings from outyear program budgets can make it more difficult to achieve R-TOC goals. Budget cuts can make it impossible to make the investments necessary to achieve the savings, but the removal of the anticipated savings cannot be corrected.

O&S Savings and Cost Estimating. O&S savings can result in other benefits (i.e. additional space claim, weight reduction, smaller footprint).

- Accurate and timely data are essential in identifying additional O&S savings
- Involve your command's cost analysis personnel as part of the IPT
- It adds discipline, structure, and credibility to cost estimating and avoidance projections.
- Track item life cycle costs
- Gives you a good idea of problems that should be addressed soonest
- Try to understand life cycle cost implications when making decisions, if possible
- Implement Reliability Centered Maintenance (RCM) analysis on fielded systems
- RCM analysis validates/optimizes equipment scheduled maintenance program
- Potential opportunity to reduce fleet maintenance man-hours
- Perform follow-up audits on previously analyzed equipment to re-validate maintenance program changes are still effective

In a recent purchase of a Commercial-off-the-Shelf (COTS) item, the vendor independently analyzed and adjusted the maintenance schedule and was able to derive \$1.76M in annual savings. Subsequently, an RCM analysis and audit was performed consisting of operators and maintainers and the vendor. This collaboration among government and private industry provided additional maintenance savings. The total projected RCM derived maintenance cost savings estimated at \$5.2M annually.

- External funding required for Non-recurring Engineering (NRE) of subsystem/component modifications
- Identifying the databases that will provide required data, obtaining internet access to these databases, understanding how to use the data and its limitations, and identifying persons that can assist in using these databases
- Experienced personnel to do forecasting; this is not a one-time occurrence; Understanding & using the databases requires concentrated, long-term effort; It also requires knowledge of the system to be analyzed
- Defining what factors will be included in determining O&S costs; If the factors considered are not clearly defined, different persons will arrive at vastly different O&S costs; Since there is no one database that provides all the data required, O&S costs must include the caveats so there is no misunderstanding on the part of the user
- Long-term follow-up is required to assure success

Our approach has been to develop and maintain programmatic RTOC baseline information as well as documentation on the newly proposed and replacement systems. Initiatives are considered only when there are clear benefits of going to the new proposed system. Tracking metrics are applied wherever possible to provide a picture of net benefits accrued through all improvements made to the new system. Our discipline of model development and maintenance reveals the difficulty of overcoming long-term cost trends built into such variables as AVDLR annual cost.

In actual practice, specific results have been difficult to document. Problems encountered have included the lack of visibility within the present database reporting and the number of variables affecting each initiative. Currently it is impossible to track costs on a mission-by-mission basis. Without this visibility, it becomes difficult to document "before" and "after" costs relative to the initiative. Adding to the lack of visibility are the numerous variables affecting the reported costs. Thus it becomes impossible to tell whether a helicopter weight reduction initiative improved fuel

consumption because specific mission operating weights are unknown as is the ability to see fuel consumption differences between CONUS, Carrier, and Desert operations. This difficulty in tracking the net avoidances is why the, not unexpected, Comptroller reaction to take the "savings" out of Fleet accounts predicted to be benefited from the investment needs to be ignored.

One of our recommendations is to not develop and use a joint contractor/government cost model. Second, our program is still in the development phase and, as a result, still has the ability to make changes to the overall program that will have a large impact on the potential life-cycle costs when the system is fielded. Having a responsive O&S team has allowed us to consider, and have a positive impact on, long-haul system life-cycle cost features in program trade studies. In addition, O&S estimators should make an effort to work closely with their Earned Value Management (EVM) counterparts to maintain an understanding of program risk and potential growth areas.

Key to the process is the need to periodically perform a complete and detailed IBR to highlight and track potential risk areas.

Finally, alternate methodologies and crosschecks are absolutely essential to developing confidence and establishing a reasonable level of credibility in the realism of our estimates.

Need to link O&S cost reductions to mission capability rates: While we are focused on meeting OSD goals for O&S cost reduction, it is apparent that these metrics must be viewed in the context of the warfighters' requirements for capability and sortie generation.

Our program has a mix of new production and retiring in-service systems. To ensure the greatest estimating accuracy, the Life-Cycle Cost (LCC) model tailors each platform's cost estimates as closely as possible to historical conditions such that, for example, retiring aircraft have fewer modifications and training costs in the last years before retirement while new aircraft have lower maintenance costs in the first years after introduction. All cost elements were analyzed in this way to determine if they would vary at the time of introduction or retirement to more reliably model costs to be incurred for each fiscal year.

While numerous cost savings/avoidance initiatives have been implemented through either program or outside funding, reductions are rarely made in out-year estimates. This practice has nothing to do with the validity associated with the cost saving/avoidance or with the estimated impact on current average costs. Rather, it has to do with the number of variables associated with cost drivers and the impact significance level of the approved initiative. Variables include the changing mix of missions, changing pilot community, and variations in deployment schedules and locations.

For example, an initiative may involve a configuration change that decreases operating weights to the point where a gallon per flight hour decrease in fuel consumption is anticipated. After modification incorporation, analysis indicates that actual fuel consumption remains unchanged or has increased. Only by using the same mix of variables and ensuring no other unrelated weight changes occur can the discrete impact of this initiative be assessed accurately. In actual operation other, unrelated, modifications are routinely incorporated affecting aircraft weight; pilots, missions, and operating theaters change; and variations in material condition resulting from differences in maintenance philosophy between commands all conspire to produce different than expected costs. Thus, in this case, the weight reduction could still be justified on the basis that the rate of fuel consumption increase that would have otherwise been experienced was reduced or lessened by implementing the weight reduction even though there was no overall decrease in consumption.

Based on these observations, life-cycle estimate updates are affected by initiatives only when there is little impact attributable to measured variables. Policy changes in the way depot maintenance is performed would be reflected in estimates, but elements at the mercy of numerous variables would not be changed until the reported actual expenses began to affect the historical averages. This approach allows for greater emphasis on more realistic estimates and actual costs incurred by the users.

Another lesson learned is the situation where a historical trend exists, such as for Depot Level Repairables and consumables. Costs for these elements have been increasing annually approximately 8 percent and 5.2 percent, respectively, in constant year costs (i.e., without inflation). These increases are attributable to many factors, including hardware obsolescence, organic and commercial repair cost increases, component fatigue due to numerous rework events, and increasing technological sophistication.

One lesson learned at the program level is that while these trends are understood, acknowledged, and reflected in budget submittals, senior DoD leadership has historically been unwilling to accept these trends, especially when establishing cost savings-avoidance goals. Goals are usually established from a baseline year to some point in the future with the assumption that the only thing affecting program costs is inflation. This is simply not the case, as validated by many years of data.

One contributor to this trend is the discontinuance of repair and/or replacement support by original equipment manufacturers for older components with low annual repair demand. Without a significant likelihood of return on the investment in a repair/manufacturing line, contractors are declining to compete with organic facilities for this workload. While, in the long term, it might be more cost effective to replace the problem component with a newer item rather than continuing to organically reverse engineer repairs, this is rarely seen as a viable alternative. There is little enthusiasm to invest limited retrofit modification funding on upgrading obsolete hardware. An example of this type of improvement would be an R-TOC funded test set that had a steadily decreasing capability over the past 4 years. These funds are usually reserved for adding a new or expanded capability. If DoD leadership is committed to lowering O&S costs, additional emphasis needs to be placed on making the existing missions less expensive to support, as opposed to emphasizing only the addition of new capabilities.

Another lesson learned is that all program cost element categories are not created equal. While it is easy to establish a goal of reducing total annual program O&S costs by 15 percent, for example, it is quite another matter to effect this reduction. If we assume a PM uses his O&S budgeted resources of program-related logistics and engineering support, modifications, and technical manuals, amounting to 15 percent of the total annual O&S budget, to provide the same historical level of support for those elements and concurrently institutes an aggressive program to substantially improve component reliability, the question raised is, "How much can be accomplished?" Knowing that "substantial" reliability improvements can be achieved only on a limited number of the thousands of system components in any given fiscal year and that non-recurring engineering costs are the major driver of this type of configuration change, the logical answer is, "Not much and not quickly."

If we assume a rather substantial 20 percent investment of available PM-budgeted funds is used to effect this change, or 3 percent of the annual total budget, work on perhaps one or two components can begin. If we further assume that reliability can somehow be improved by 100 percent on those two components, we can expect related depot repairables and possibly consumable costs for these components to be reduced to 50 percent of the annual historical cost. If it were further assumed that these two parts are major cost drivers, they may account for 2 percent of the total depot repairable costs and 1 percent of the total consumable costs. Given that depot repairables comprise 21 percent of the total annual O&S costs and consumables 9 percent of the total O&S costs, the impact of the theoretical reliability improvement on the total annual O&S budget would be less than 1 percent, at 0.26 percent. Improvements related to non-cost-driver components would produce significantly fewer savings on a component-by-component basis.

Considering the timeframe for implementing a major component upgrade, the assumption would be 2 to 3 years to develop the concept, build a prototype, and verify the solution; another 1 to 2 years to produce the kits for installation; and another 3 to 5 years to upgrade all aircraft on a non-interference basis. Thus, the average major modification would take 6 to 10 years from concept development through upgrade of the entire community. It should be remembered that the full 0.26 percent savings cannot be realized until all aircraft have been upgraded.

It can thus be seen that even a 1-percent reduction in total O&S costs would require substantial investments, well in excess of those previously made available on a per-program basis for funding R-TOC initiatives. Investments at these levels would also be well beyond the capacity of the PM to devote within traditional budget limitations and could take a decade or longer before the return on investment could be expected to reach a break-even point.

To approach the issue from another angle, to achieve a 15 percent reduction in total annual program O&S costs would require both the depot repairables (21 percent) and consumable costs (9 percent) to be reduced by 50 percent. To achieve such a reduction would require hundreds of millions of investment dollars. It should be further noted that the amount of return may be insufficient, when considering the required investment, to "pay" for itself over the course of the helicopter's service life. Reality would indicate that a point will eventually be reached beyond which it will become practically impossible to reduce O&S costs.

Unfortunately even such a draconian approach as the 15-percent cost reduction example cited above would not result in the target goal being achieved since there are still the depot repairables (8 percent) and consumable (5.2 percent) cost growth trends to overcome. While it is logical to assume that some of the historical trend would be eliminated by the introduction of newly designed, more reliable components, it is also likely that some of it would remain. Further, as the new hardware would begin to age, the impact of the historical trends would tend to be reasserted.

The PM could also impact O&S costs by modifying the maintenance philosophy of the program. Such an initiative would either be based on the assumption that the original maintenance procedures were faulty or inefficient or that some new, totally original philosophy has been created. While it is unlikely that the original philosophy would be flawed considering the attention to maintenance procedures applied by government and contractor logisticians and engineers using RCM and similar techniques, new philosophies are possible. One such new philosophy, the Integrated Maintenance Program (IMP), has begun to be applied to selected aviation programs for depot maintenance since Fiscal Year 2000. This change represents a major departure from that employed previously. Changes of this magnitude happen on average every 20 to 30 years, so it is unlikely another revision will be forthcoming in the foreseeable future. Thus, maintenance changes causing major savings in O&S costs are not considered a serious probability.

Additionally, the example used in this lesson highlights the dilemma of the PM. While investing budgeted dollars in the program to achieve lower O&S costs, savings revert to another budgeting official. This other official may choose to invest them in a totally different program to cover cost growth resulting from a lack of proactive PM initiative on that program. While such a result may give the PM the satisfaction of having benefited the Service as a whole, and the PM's particular community, it currently results in the PM sacrificing a large portion of a limited budget without any possibility of sharing in the savings created. Allowing the PM to receive some or all of the resultant savings through direct budget transfers would reward proactive management and create a revolving account within each program to support future savings initiatives. Further, such a scenario would guarantee that only those PMs maintaining active O&S cost reduction programs would benefit and provide a self-monitoring system wherein money becomes available only to those PMs producing results.

Management

R-TOC Participation. Every segment of the program must take ownership and be responsible for integrating the R-TOC Process; one program's "Core Team," is responsible for implementing the R-TOC program, consists of representatives from the user command, the operating wing, the contractor, the National Guard Bureau, and the Program Office. R-TOC "Champions" are selected within each IPT to lead and facilitate the identification of cost-reduction initiatives. They serve as the key IPT interface with the Core Team.

R-TOC must be a "Team" effort in-order to succeed; every facet of the program must be focused on achieving cost savings. Every savings idea is a potential R-TOC initiative. For continued long-term

success, personnel must be aligned and day-to-day processes must evolve in ways consistent with R-TOC.

It is important to provide info briefs to senior level champions. They are necessary to keep the program sold.

R-TOC has been more effective when closely aligned with program execution and acquisition logistics, with every facet of the program aimed at cost savings. The program encourages and believes every savings idea is a potential R-TOC initiative. R-TOC initiatives have been integrated into corporate decision making processes—requirements generation, acquisition program baselines, and the Planning, Programming, and Budgeting System (PPBS).

Early involvement of the command's cost analysis personnel on the R-TOC IPT adds discipline, structure, and credibility to cost estimating and avoidance projections.

Program Management. Although labor intensive for the program office, being an R-TOC program has provided the visibility needed for some programs to obtain additional funding for O&S cost-reduction initiatives.

However, some programs are concerned that the benefits of R-TOC participation might not equal the costs. Some programs have noted a lack of support for R-TOC within the budget process or among competing functional organizations and programs. "Changing the way business is done" is difficult, and program offices may not be staffed adequately to handle R-TOC analytical and programmatic requirements. Some programs have suggested that R-TOC programs should receive higher priority for Service investments and have advocated reinvestment authority for all or a portion of R-TOC savings.

Phases of R-TOC Activity. Early in the program, the TOC emphasis is likely to be on "designing" in supportability, e.g., improved reliability and maintainability, and using an Integrated Product Data Environment to automate labor-intensive operations. As the program moves through the life cycle, the emphasis is likely to shift to a life cycle support strategy based on a long-term partnership with industry, which has potential to further reduce O&S cost. The program manager's Affordability Cost Candidate (ACC) program, a joint government/industry effort designed to improve acquisition cost performance, is an effective way to identify potential cost avoidance proposals.

Build a master schedule—discuss it weekly & track overdue issues.

Benefits of R-TOC Participation. Several R-TOC programs noted that benefits of participation in R-TOC can include higher visibility, higher priority for funding requests, and access to good ideas from other R-TOC programs. One program observed that PBD 721 and CREIC-supported funding was a big boost to the program and will contribute significantly to program R-TOC goals. The program also observed that the R-TOC Quarterly Forum meetings provides opportunity to exchange ideas across services and programs' quarterly reports provide simple mechanisms to report progress and least intrusive to the team. Another program office has had representatives attend Cost Reduction IPT (CRIPT) meetings held by other R-TOC programs and stated that cross-community participation helps all programs involved.

Coordination of Requirements. Several R-TOC programs have found that having authority to manage both "acquisition" and "legacy" requirements has big advantages for both PM and the command. It can result in improved synchronization and avoidance of potential duplicative software functionality.

R-TOC Metrics. Accurately capturing Savings/Avoidance is a challenge:

- How do we and OSD standardize this "score keeping" function?
- Overcoming multiple cumbersome BCA processes

- Need to develop agreed-to Ground Rules and Assumptions
- Inadequate number of cost analysts
 - Significant effort required to accurately document cost savings
- Constantly fluctuating technical baseline (ECPs, ACAT programs, etc.)
- Current Cy04 baseline does not credit early life initiatives
 - Early life initiatives have the greatest ROI/Opportunity to produce savings
- Periodicity of R-TOC reporting is out of sync with annual nature of price and cost changes

It's all about the money!

- Large savings require large investments
 - These large investments are extremely difficult to obtain
- Tracking and accounting for savings and/or cost avoidance is extremely difficult
 - Investment and savings almost always in different funding lines with different sponsors and stakeholders
- OSD R-TOC funding
 - Service competition for limited funds drives to small efforts
 - Color of money (RDT&E) impedes program funds obligation
- "Cobbling" together of small amounts of funding from different sources is hampered by "colors" of money and different funding lines
 - Drives a significant amount of "bad behavior"

Cross Service Opportunities need to be investigated and used.

The OSD Initiative Review Process has established a minimum threshold of acceptability for benefits of the newly proposed systems. The OSD templates and documentation processes establish a standardized infrastructure that allows comparisons across newly proposed systems comparable to the internal rate of return investment arrays used by industry. These tools provide a valuable means of performing the initial go-no go initiative assessment to ensure there is value and to quantify the relative rankings of competing initiatives.

The Quarterly Forums provide an excellent opportunity to discuss innovative ideas and approaches used by PMs in other Services. These forums not only allow cross-fertilization of ideas but a forum for open discussion and greater understanding. This process has contributed to several joint initiatives between Navy and Army programs. The discussions prompted by these forums have led the Navy to adopt initiatives already implemented by the Army and vice versa. Without the discussions fostered by these forums, neither program would be as successful as they now are.

One negative lesson is that inadequate R-TOC funding has been supplied to support initiative investment. A major expense of equipment modification is the non-recurring cost of engineering investigation and analysis. Often significant research and investigation is required to address the negative effects of cost and maintenance drivers and develop alternatives. Anything less than \$25 million to \$35 million annually per Service precludes the most meaningful projects. The R-TOC funds are Research, Development, Test and Evaluation (RDT&E) in "color." Only the certain components of our program are authorized to receive RDT&E funds. As an alternative, a PM must "cobble together" the "up front" or "execution" funds required for an investment from various sources and "colors" of funding. While there are procedures in place to permit this swapping of accounts, it was obviously not the intent of Congress when the money was originally appropriated. Also it makes it risky to start a multiyear effort this way since follow-on funding is unbudgeted and may be unavailable. Having larger R-TOC investment blocks available would go far toward reducing execution risk.

One way to spread R-TOC to all DoD programs would be to require each program to prepare not just a TOC plan but an R-TOC plan. With annual updates reviewed at the Program Executive Office (PEO) and Service levels, success stories could be circulated throughout DoD to stimulate further applications and a cross-pollination of ideas. Future R-TOC quarterly program representation might then be drawn from each Service's outstanding achievers so that attendance at a meeting would represent formal recognition of program achievement. Such a selection process would then effectively

make every DoD program a potential R-TOC success story. Further, if monetary awards were then made to the top achievers to reinvest in future program efficiency, this would take the RTOC concept back to its roots. Since the original purpose of R-TOC was to provide PMs with more control and flexibility over their programs, the monetary awards (presently termed "R-TOC investment funds") would allow the PM to direct these additional resources to the area of greatest need within the program. One of the current disparities in making R-TOC investments results from the fact that investment costs primarily accrue to the investing Program Office while the Fleet is the projected usual beneficiary of any avoidances that accrue. Whereas the present R-TOC funding system is a competition among future projects based on a theoretical return on investment, the change proposed above would actually reward demonstrated, successful PM leadership.

Another lesson learned from the R-TOC forum aspect is that no one has the patent on good ideas. Many great ideas were raised at the R-TOC Quarterly Forums and brought back to the program for implementation. The DLA R-TOC funding program that was briefed we are now taking advantage of and will receive funding. Information and points of contact from the Service or community are used to help resolve issues. Periodically a program would brief how they overcame a bureaucratic obstacle. We then used a similar tactic to overcome the problem. The R-TOC forum forced organizations to come together and discuss R-TOC issues. The R-TOC forum continued to try to resolve OSD-type issues. One major issue was understanding how organizations can keep some of the funding benefits received from R-TOC initiatives. How can we use different colors of money or combine types of funding to accomplish R-TOC ventures? Bureaucratic obstacles such as these have not been breached, but the R-TOC leadership understands the community problems and continually tries to resolve such issues.

- Expand R-TOC vision beyond near term; look to encompass the weapon system life cycle
- Apply a holistic approach to all initiatives; pursuing model to incorporate all initiatives for one weapon system
- Include Country PMs, EPAF, and ILO representatives in processes
- Integrated R-TOC into Corporate Board and Program Reviews to facilitate cross coordination with engineering community

It is important to remember that the R-TOC funding provided to date for cost savings/avoidance initiatives has been a valuable addition to program budgets. Some initiatives have been funded years earlier than they would have been otherwise, while others would still remain unfunded if not for R-TOC. The user community has benefited from improved procedures, more reliable hardware, and lower costs than would have otherwise been expected.

Notwithstanding these benefits, expectations must be tempered with realism. In most cases, the best that can be hoped for on a cost basis is that the increasing slope of the historical cost trends will be ameliorated. Admitting there are rarely net reductions in O&S costs is not an admission of defeat; rather it is a recognition of the myriad variables involved. True savings in O&S costs need to come during Concept Exploration and Design Development. The majority of solutions arriving during in-service operations are after-the-fact patches that, at best, result in minimal O&S savings due to associated non-recurring engineering, kit, and installation costs. We still need to do them to improve program efficiency but significant O&S savings can best be achieved when designed in or prior to production.

New/better R-TOC metrics are needed. Most R-TOC programs are finding that traditional information systems do not provide the right information to track R-TOC baselines, investments, and cost savings. The R-TOC Working Group and the R-TOC programs are working to develop better visibility of O&S costs and improved metrics to help develop O&S cost baselines, identify sources of funding for readiness improvement and sustainability investments, and measure the impact of R-TOC improvements. Development of accurate R-TOC metrics is difficult, especially when the R-TOC improvements are deployed across a diverse range of systems and platforms. Lack of visibility into O&S costs at the system level can make it particularly difficult to identify the benefits of potential R-TOC activities. Some programs advocated establishing a database of relevant government O&S cost returns and studies.

Consistency in tracking R-TOC metrics can also be difficult. Use of conventional cost templates can generate erroneous aggregates for individual projects. The proponents for R-TOC initiatives must validate and verify the assumptions and methodologies used for cost/benefit analyses. A system of metrics must be developed to assess the performance of installed R-TOC initiatives. It is difficult to consistently get data and feedback from the ships for installed R-TOC initiatives.

Projected metrics developed prior to TOC installation often vary when developed at independent sources and may not agree with actual data gathered after the initiative has been installed. It will be difficult to develop metrics for cost avoidance and determine actual savings. True R-TOC savings may not be known until the initiative has been installed for many years and return costs can be measured.

Team Participation. Active participation by all members of a large and complex team is required for R-TOC success. This participation includes many different functional offices within the PM organization, the buying command, the user, and the equipment manufacturer. The sponsor also must establish a TOC-conscious culture within government and industry. It is important to identify the government/industry team at the start...keep roster constant.

One program has established the PM's Life Cycle Management Office co-located with the following functional areas: logistics division; field task force organizations; acquisition division with contracting officers; business management office; and technical management office. The maintenance team and the contractor supportability team is co-located with the government logistics personnel.

Although the program/project manager is typically responsible for identifying potential R-TOC activities, it is increasingly evident that many other organizations must also be involved in R-TOC. In fact, in many cases, the PM may not be responsible for the funding necessary to implement an R-TOC initiative and may need to coordinate basic funding decisions with other organizations. Participating organizations should include: the buying command/PEO structure, the user, organizations with logistics support responsibilities, organizations with budget development and approval authority, and the prime contractor/major subcontractors. User involvement is particularly important in building support for ownership cost reduction initiatives, especially in the case of fielded systems where the user controls many of the funding sources. One program has established a cross-functional team specifically to look at potential R-TOC cost reduction candidates. This team consists of: logistics personnel from the program office, cost team analysts, and prime contractor representatives.

User support for R-TOC initiatives is critical. R-TOC efforts will be hindered until the user gets sufficient direction to participate in these initiatives. This requires working with users to help them understand the benefits of the initiatives, incorporating their feedback into the system, and working with them to ensure that implementation funding is included in the budget.

One program observed that R-TOC costs cannot be implemented by acquisition commands alone. Warfighters and maintainers have a large role in how ownership costs associated with the operation and maintenance of the system can be minimized. Increased management attention with maintenance management at the local levels can lead to efficiencies that will result in overall TOC reduction in Fleet-managed O&S funding accounts.

The total weapon system supplier base (primes and subs) also must be engaged in R-TOC and actively pursuing cost-reduction initiatives.

Acquisition Strategy. Understand the requirement and tackle the big strategy issues up front. Make R-TOC a part of the program strategy: The Program Office has set a flyaway cost goal; however, this goal may conflict with potential O&S cost-reduction initiatives. Decisions should be made on the overall "best" benefit to the Warfighter.

Planning. Identify the databases that will provide required data, obtain internet access to these databases, understand how to use the data and its limitations, and identify persons that can

assist in using these databases. Significant data and database integration shortfalls adversely impact analysis.

Experienced personnel to do forecasting is necessary; this is not a one-time occurrence. Understanding and using the databases requires concentrated, long-term effort. It also requires knowledge of the system to be analyzed. It cannot be accomplished by a novice.

External funding for non-recurring engineering (NRE) is essential. There is a need to ensure any recurring funding requirements are in place to enable complete implementation.

Define what factors will be included in determining O&S costs. If the standard factors considered are not clearly defined and obtainable, different persons will arrive at vastly different O&S costs. Since no one database provides all the data required, O&S costs must include the caveats so there is no misunderstanding on the part of the user.

- Long-term follow-up is required to assure success.
- Continue working short- and long-term actions – can't wait on funding!
- Gather timely feedback from all personnel, embedded personnel, survey visits, and conference calls
- Participate in formal IPTs, conferences, others; share findings with all
- Act upon feedback for improved contract coverage; tweak existing coverage i.e., sustainment visibility
- Add data collection to ensure coverage is efficient as well as effective

Need for strategic R-TOC planning: it is imperative that all stakeholders in the weapons system be involved in R-TOC initiatives. Production and O&S cost-reduction efforts must be integrated at the program level to optimize investments toward an R-TOC goal. With the establishment of a Strategic Objective to have a balanced cost-reduction program and Program Goal to begin implementation in CY05, TOC has been elevated to a Program Manager level of interest.

It is imperative an implementation plan is agreed to during the design and development phase. This will ensure sufficient time is available to budget, obtain funds, and procure hardware at the earliest possible date. Decisions and agreements should be documented and coordinated by all stakeholders to include using commands, parts suppliers, maintainers, and the SPO during the Maintenance Planning Working Groups, CIP reviews, and Program Management Reviews.

The fleet is small in size and is vital to cost-reduction efforts to maintain commonality with other similar systems. Maintaining commonality requires incorporation of hardware changes that may not be necessary to improve performance, durability, or reliability, but are necessary to improve maintainability and supportability. Therefore, during times of resource constraints, competing priorities for modifications mitigating safety issues may delay the implementation schedules. If this occurs, the FY10 cost-reduction goal will be delayed accordingly.

- Build advocacy early in program development phase
- Large system inventory drives higher investment cost and longer implementation time
- Focus on integrating reliability, supportability, and capability into all initiatives
- Use a system-wide perspective that includes the international business base and provides opportunities for cost sharing

Communication/Coordination. Weekly management telecons and monthly meetings keep all agencies apprised on status of efforts and up to date on program initiatives.

- Semi-Annual Manufacturers Conferences are held to exchange ideas and provide information on issues that affect all parties
- "One Team" approach – Full teaming with other government entities and industry partners

- Leverage off Depot – OEM Partnership and Performance Based Logistics information from Naval Air Systems Command and Corpus Christi Army Depot
- Monitor Transmission Enterprise Work
- Material Developer and Sustainment Command must work together
- Develop combined strategy for legacy sustainment
- All stakeholders must participate in periodic meetings
- Work with DA/OSD to remove obstructions to sustainment benefits
- Color-of-money issues
- Control of funding
- Ease funding programs and improve incentives for organizations to participate in R-TOC programs

The program's most important lesson learned was that it is vital to get the material developer, the sustainment command user community, and the Service Headquarters invested early in the program and keep all parties working toward a common goal. We developed Life Cycle Management that includes the PM and the Sustainment Community. This IPT prioritizes efforts and where funding is available. The PM and sustainer developed a WIPT to manage these efforts and track problem areas in a spreadsheet of all the program sustainment and modernization issues. Smaller IPTs are established to research and devise solutions to issues and best solutions were accepted by the community. Logistics and Engineering and Software worked simultaneously early in a program to solve problems. The community working together allowed modernization and sustainment to work together. This reduced costs as each organization could concentrate on their specific expertise. This brought the PM and the sustainment community much closer together, and they worked together to successfully support the warfighters in the field.

It is important to work with Service Headquarters and OSD on overcoming and solving regulatory and policy obstacles to R-TOC. Often the sustainment community or the material developer is limited to what can be accomplished because of the type of funding or how repairs are funded. The current Service sustainment system is designed to support a weapon system with many parts and numerous end-items. The cost of producing spare parts is amortized over tens or even hundreds of parts. These parts are stocked and generally easily replaceable by local maintenance personnel. Replacements are ordered and the unit is charged a low dollar amount. A low-density high-dollar system, on the other hand, often finds that there are generally few Line Replaceable Units (LRUs) or parts stocked and therefore must be strictly managed to support systems that are deployed worldwide. If an LRU fails often it has to be repaired by a depot or the Original Equipment Manufacturer (OEM). The unit buys an LRU for \$100,000 and then returns the LRU to the depot or the OEM. This is very expensive, and a few LRUs can quickly expend the unit's support funding.

- Operator buy-in at every step is essential to realizing the full potential of savings
- Operator maintenance personnel must be involved from the beginning so that initiatives are pulled to the users instead of pushed
- Aligning initiatives to meet user needs are critical to successful implementation, and sometimes user priorities can change
- User buy-in is critical in order to process changes necessary for evaluating new technologies and user resources are identified early in the change process pending successful prototyping
- Systems 15 years from now will be the same as systems today
- We cannot wait for new platforms to come on line to achieve savings
- New technologies must address legacy platforms
- Soft savings (manpower) initiatives of this program must be combined with those of other programs to achieve real savings with the goal of reducing manpower
- Combining manpower saving initiatives to address the full workload of a single individual will result in the ability to cut manning levels, resulting in real savings

RELIABILITY AND MAINTENANCE IMPROVEMENTS

Readiness Improvements. R-TOC is not simply a program to reduce O&S costs. Besides reducing TOC, most conceivable Reliability and Maintenance (R&M) improvements will also improve system performance, reliability, or readiness. Some of the readiness measures include:

- Reduction of failure rate or improved reliability in terms of mean time between failure (MTBF);
- Reduction of mean time to repair (MTTR)/maintenance man-hours;
- Reduction of spare part requisition fill response times;
- Reduction in deployable footprint/weight;
- Reduction in no-fault-found test call outs
- Reduction of test equipment set up and warm up times
- Reduction of test program set end-to-end run times;

Designing in TOC Reductions. The majority of a weapon system's future life-cycle costs (LCC) are tied to design. Consequently, to maximize LCC savings, reliability, maintainability, and sustainability (RM&S) must be built into the system from its inception. As upgrades and enhancements are made, the implication of any proposed changes for life cycle cost should be a key parameter in evaluating these modifications. One program uses the Component Improvement Program (CIP) as a means of redesigning components. This involves coordination with program managers, engineers, and the prime contractor. CIP focuses on safety, reliability, obsolescence issues, and cost reduction through component redesign.

Sustaining Engineering. Once a system is out of production, PMs can have a difficult time identifying funds for sustaining engineering projects that would improve RM&S. While systems still are in production, funds for these activities are subject to the PM's control. Once the system is out of production, O&S funds typically are controlled by the users, who are likely to have different priorities for sustaining engineering projects.

Legacy Systems. Major modifications may provide the best opportunity to implement O&S cost reductions and readiness improvements in legacy systems.

One-of-a-Kind Systems. One-of-a-kind or few-of-a-kind systems pose unique challenges for R-TOC because the improvements are spread across only a small number of systems and many have unique configurations.

O&S Cost Drivers. Identifying O&S cost drivers and prime readiness degraders (low MTBF components or practices that contribute to frequent repairs or replacements) can provide significant readiness improvements while also reducing TOC.

O&S Cost Drivers. Focusing on O&S cost drivers and principal readiness inhibitors can yield the best results for R-TOC investments. Often, a single subsystem, component, or practice is found to be a major driver of either O&S costs or readiness inhibition. Several R-TOC programs have achieved significant cost savings and readiness improvements by identifying these critical issues early in the R-TOC process.

O&S Cost Increases. It is important to recognize that aging systems will continually face "unknowns" that will drive up O&S costs. Additionally, installation of new subsystems can increase capability but also increase manning and maintenance requirements (and TOC).

Another constraint to reducing the net TOC of a ship is that some new shipboard systems will increase TOC, but congressional mandates or other legislation require that they be installed. For example, because of congressional mandates issued to reduce pollution of the seas, pollution control systems have been installed (Plastic Waste Processors, Oily Waste Separators, etc.). While these

systems are necessary and important, they necessitate additional maintenance and manpower, thereby increasing TOC.

Transition of Technologies. In the case of relatively proven technologies, hurdling from R&D into acquisition/implementation is a major obstacle. Simply doing a demonstration of technology is not enough to clear that barrier. We must actively work to overcome all obstacles up front (i.e., testing, documentation, drawings, procedural/policy/guidance changes) and couple the technology with the actual fleet need in order to achieve a sound acquisition package and approval for installation. Formation of the Service-Industry IPT for the sole purpose of identifying and conquering those obstacles to acquisition through teaming and risk mitigation has assisted the process.

SUPPLY CHAIN RESPONSE TIME/FOOTPRINT REDUCTION

R-TOC projects can achieve significant cost savings through supply chain management process and efficiency improvements. R-TOC programs have implemented a wide range of projects to improve the management or efficiency of the system's supply chain. Direct vendor delivery (DVD) contracts, corporate contracts, and other supply chain initiatives can reduce logistics cycle time at the same time it reduces O&S costs.

Supply Chain. Supply chain management process and efficiency improvements, including increased use of corporate contracts, DVD arrangements, industrial prime vendor/virtual prime vendor arrangements, and reductions in DLA cost-recovery rates can result in significant cost reductions at the same time parts availability improves.

Cost of Supply Chain Improvement Initiatives. Many TOC-reduction initiatives involving supply chain improvements or footprint reduction involve process changes rather than investments in new hardware and can be implemented without large up-front investments.

Fielded Systems. Mature systems have many opportunities for R-TOC outside of traditional Cost Savings Modernization Initiatives/upgrades, including strategic sourcing/supply chain management initiatives and decision support systems that link into the supply chain. However, it can be hard to quantify the savings achieved by initiatives such as these.

Depot Maintenance. Significant O&S cost reductions can be achieved by extending depot maintenance cycles. By grouping depot maintenance activities differently and using actual experience with systems in the field, it may be possible to extend these cycles without impacting system performance or reliability.

Lean Depot Practices. Savings/cost avoidance and decreased flow-days in depot maintenance, resulting from Lean Production initiatives, will result in increased aircraft availability, but not necessarily a dollar savings for the user.

Commercial Maintenance Agreements. Commercial maintenance agreements can provide incentives for contractors to improve reliability and availability and reduce TOC.

Reliability Centered Maintenance (RCM). All programs should perform RCM-type analysis on equipment that has significant maintenance requirements. RCM analyses have been shown to have a tremendous impact on reducing maintenance man-hours, hazardous material purchasing and disposal costs. One Pilot Program expects to save 120,000 maintenance man hours per year and reduce system downtime by switching to this concept. Another program has a projected cost avoidance of \$202 million over the life of the program. It is important to include the user maintainers in the analysis process, which helps ensure user buy-in and smooth adoption of equipment maintenance changes. It is also important to periodically re-look at the implemented changes to ensure that the changes are having the desired effect. Electronic Maintenance Aids, Interactive Electronic Technical Manuals (IETMs) and other electronic maintenance aids can reduce the time and

cost of performing maintenance tasks, improve training of maintenance personnel, and accommodate changes easily and quickly.

COMPETITIVE PRODUCT SUPPORT

R-TOC programs have been at the forefront of DoD's recent initiatives to promote Total Life Cycle Systems Management (TLCSM) and Performance Based Logistics (PBL). Several programs have developed innovative new support arrangements that are now models for all DoD systems.

Planning for Support. Significant cost savings can be achieved by competing work traditionally performed in government depots. Because it takes time to build and coordinate an innovative product support strategy, it is important to begin this planning early in the system's life cycle.

Life Cycle Support studies should include representation from all stakeholders, including the program office, depots, and users.

Contractor Logistics Support (CLS). (1) Get early involvement and support in the proposed support concept from the user community. (2) Ensure support concept minimizes changes to the way the soldier maintainer currently conducts his support mission. Example: retain standard information systems. (3) Don't impact the military force structure. (4) Work funding issues early. (5) If contractor supported, focus on contractor-on-the-battlefield issues in planning/developing support concept.

CLS Funding. To adequately fund a multiple year CLS contract, the government must commit long-term Operations and Maintenance (O&M) funding. A long-term shortfall of O&M funding will adversely affect weapon system readiness and soldier support. In other words, budget reform has not kept pace with acquisition reform or logistics reform.

Performance Based Logistics. PBL efforts have produced cost avoidances in administering repair parts transactions and higher spares availability, but it requires (1) a dedicated team of cost, logistics, and engineering personnel to support annual negotiations and ensure equitable established prices, and (2) good failure history to negotiate a fair fixed price.

Government Responsibility. Even in cases where a contractor is given Total Systems Performance Responsibility (TSPR), the program director still has the ultimate responsibility for customer satisfaction. The program should consider "off-ramps" to maintain competitive pressure on the contractor and protect the government in case the arrangement doesn't work out (e.g., provisions for recompetition, return to organic support, etc.)

Life cycle support partnerships between the depots and private industry can provide a successful way to reduce TOC while taking advantage of the best available capabilities.

Incentives. Incentive is the key to energizing the contractor. Allowing the contractor to program savings internally to other cost saving initiatives offers appropriate incentive for effective implementation of R-TOC. If the savings are not recouped by the initiative owner and R-TOC is simply mandated, there is likely to be substantially less imagination and creativity generated.

Award fee and award term contracts, which increase the contractor's profits or the length of the contract, can provide strong incentives to reduce TOC.

Policies. Some relief from legislative or policy requirements (e.g., A-76 procedures, 50:50 workshare requirements, core logistics capabilities, etc.) may be required before it is possible to implement competitive product support on a widespread basis.

Timing. The ability to implement competitive product support is limited for legacy systems. Major modifications and other major events provide an important opportunity to implement these arrangements.

Commercial Improvements. Incorporating improvements that occur naturally in the marketplace (commercial technologies, products, and processes) is one way to reduce O&S costs.

Benefits. Besides reducing costs, competitive product support arrangements can make substantial improvements in maintenance lead time, reliability, and readiness.

Performance Based Logistics. Periodic PBL Reviews or Audits of the PSI's processes and procedures need to be conducted by the Program Management Office (PMO) or an independent agency. These reviews/audits will determine the efficiency and effectiveness of the metrics.

This latest Alpha Session with the OEM highlights the concept that metrics should be established for outcomes rather than placing metrics on processes.

Use the Alpha Contracting process to negotiate/determine performance metrics. You must have 'buy-in' by a number of stake holders, including the warfighter, developer, and OEM.

Our PBL efforts now provide for Sustainment Engineering using production dollars.

The contracting officer must thoroughly understand PBL or else he/she will allow fee incentives to be minimized during negotiations.

The data collection system must be robust and a check and balance system needs to be established. PMO color-of-money issues remain problematic. Make sure you have clearly documented the performance metrics you are procuring via PBL and ensure your program stays within the guidance of the Financial Management Regulation (FMR) regarding investments and expenses.

We instituted a daily report to the unit commanders as a check on the accuracy of data the Field Services Representatives were entering into our data collection system. The accuracy of the data has improved by at least 40 percent since the daily reports were implemented.

Numerous lessons have been learned for developing an integrated PBL-oriented sustainment strategy. The necessity for clear communication (both talking and listening) in a common logistics language cannot be overemphasized.

- Funding challenges need to be resolved early.
- Focus on creating a long term business arrangement that will stand the test of time and be flexible in creating mutually beneficial outcomes.
- Lots of rice bowls and traditional authorities that have to be gotten past; fight off the bureaucracy that wants to dictate "how".
- Anticipate late comers and second guessers.
- Coordination is the key; organizational chains are very long.
- Communication, communication, communication!

PBL is not clearly understood by industry. Clear understanding requires a more direct interface with industry to come to a working understanding of the concept to provide true benefit to the warfighter.

Standard R-TOC rules/formulas are not necessarily applicable to programs in all phases. We recommend tracking acquisition cost avoidance for programs still in development/acquisition phases.

System supportability needs to be higher criteria for system selection:

- High-tech subsystems
- Target Sighting System (TSS)
- Helmet-Mounted Sight Display (HMDS)

Review of other PBL concepts initiated:

- Both the U.S. Air Force and the U.S. Navy have successful PBL programs in place
- PBL planning is progressing on several major weapon systems
- Interaction with the following programs
 - F-117
 - C-17
 - JSTARS
 - F/A-18E/F FIRST
 - B-2
 - F/A-22
 - V-22

PBL may be a practical way to incentivize O&S cost management:

- Contract length affects PBL contractor Best Case Analysis
- Design incentives to reward long-term investments in availability/O&S cost reduction
- Funds traceability still a major issue

Just as all program cost elements are not created equal, the same can be said for all PBL initiatives. Some are contracted with the OEM for a single commodity or family of parts, others are contracted with a contractor (not necessarily the OEM) for all or a large portion of the components of a weapon system.

In the case of an OEM, the contractor may guarantee increased reliability or availability since they are most knowledgeable of the fabrication and repair of the parts they manufacture. This knowledge gives the OEM a competitive edge that benefits the contractor in guaranteed workload while the government benefits from lower operating costs. Since the number of "unknowns" is insignificant under this type of contract, and contractor risk is minimal, the contractor can propose leaner prices and fewer "conditions."

In the more complex Weapon System PBL, contractor risks can seem almost endless. Under this type of PBL, the contractor must assume responsibility for potentially hundreds of subcontractors in terms of component cost, availability, reliability, and repair, and the smooth interface of government and commercial repair organizations. The contractor must also be able to negotiate a contract that allows the contractor to remain in control of their ability to successfully perform. A poor choice of performance metrics or the introduction of any "unknowns" with which contractors feel uncomfortable could result in the contractors increasing their proposal price to cover risk factors. Such a scenario is counterproductive to producing greater efficiency of support. A contract that measures performance based on government actions may add both risk and cost.

For example, Supply Material Availability (SMA) may be a good performance metric since the contractor is responsible for making Ready For Issue (RFI) parts available. Another metric, such as aircraft Ready for Tasking (RFT) percentage, may be viewed as an added risk/cost factor if the PBL contractor is not responsible for aircraft repair. Such a metric may add unnecessary cost since the contractor must cover his risk that government maintenance may not be performed in a timely manner, resulting in contract penalty.

Another factor that must also be addressed is the supply system cost recovery rates. These rates are added to the base costs of repairables and consumables to reimburse the military supply system for organic administrative costs. Under PBLs, the responsibility for these administrative costs frequently shifts, in whole or in part, to the PBL contractor. Thus, under the PBL, prices may be

collectively lower than under a totally organic operation, even with no change in repair price, simply due to the lowering of cost recovery rates.

The impact of each PBL is different and, while providing “best value” to the government may or may not result in lower prices. Higher parts availability and/or improved reliability may be viewed as sufficient justification to entertain the award of a PBL contract despite a cost that is neutral or even higher than organic support. The more complex the PBL contract, the longer it will take to assess the operational costs and determine the impact on historical costs.

Reliability Centered Maintenance (RCM). After procuring a Commercial-off-the-Shelf (COTS) item, the vendor independently analyzed and adjusted the maintenance schedule and was able to derive \$1.76M in annual savings. Subsequently, a Reliability Centered Maintenance (RCM) analysis and audit was performed consisting of operators and maintainers along with technical experts from the service and the vendor. This collaboration among government and private industry provided additional maintenance savings. The total projected RCM derived maintenance cost savings is estimated at \$5.2M annually.

Rapid Development or Advanced Concept Technology Development (ACTD). A clear departure from ACTD is needed before entering production

- ACTD is not equivalent to Engineering, Manufacturing and Development (EMD)
- Focus post-ACTD development on systems engineering and sustainability as much as on capability enhancements

Evolutionary Acquisition/Spiral acquisition requires more discipline:

- Speed kills unless you plan for it
- Spiral development requires doing all phases of acquisition, all the time

Continuous refreshment of Science and Technology is necessary:

- Size, weight, and power – constant improvement needed
- Move and evaluate intelligence data faster; shorten kill chain
- System-of-systems view important
- Rapidly fielding new capabilities is great, pacing items are training and sustainment
- Quick-reaction capabilities a fact of life – distinct from spiral acquisition
- Fully fund and accelerate logistics and manufacturing planning
- Unmanned aircraft is a network/communication program disguised as an airplane

CONCLUSION

These Lessons Learned have been compiled from reports of some of the largest and most complex weapon systems development programs within the DoD. They have been gathered over a period of over five years represent the collective wisdom and experiences of many cost reduction and time saving efforts.

Careful attention to these Lessons Learned can advise and inform future activities of every DoD program.