DOWNTIME WASTES THE RESOURCE

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SUMMARY

This paper presents an overview of Logistics Support problems in Simulation Programs and discusses the impact of Design to Cost and Life Cycle Costs in the Logistics discipline.

DOWNTIME WASTES THE RESOURCE

Logistics - No Longer a "Tail-end Charlie"

The Logistics element of industry has been referred to, in the *words of the Now Generation, as "the Pits." Logistics personnel* have historically been:

- the last to receive the word
- the last to know about changes
- the last to have anything to do with the hardware or the software

and the first — to feel the wrath of the customer when something goes wrong with the equipment.

Those days are ending. Logistics Support can no longer be a "Tail-end Charlie." Logistics is coming of age.

Design To Cost (DTC) and Life Cycle Costing (LCC), given "lip service" by buyer and seller alike for many years, are now formidable tools and definitive requirements on many of the more *recent Government contracts. LCC virtually catapults Logistics from* the background to the forefront of a simulation program and for its duration.

LCC may serve to wake up industry and the military buyer alike. Industry, from the standpoint that a very significant checkpoint, namely Logistics, will now actively influence the design and manufacture of simulation equipment, with the specific intent of ensuring that the equipment can be supported in the field. The military customer, in that if he indeed institutes and follows LCC guidelines, he can literally prevent the downstream expenditure of millions of dollars and receive far better, more reliable and supportable equipment.

Logistics Can Make The Difference

Proper Logistics planning and implementation of that plan can make the difference in whether the simulator is a resource asset or a liability.

With increasing concern for fuel reserves and a national, hopefully world-wide, effort to conserve natural resources, it may well be that the simulator building will become tomorrow's flight line. The simulator user will require and demand maximum equipment availability.

To ensure maximum availability, the support pipeline must be clean and smooth flowing.

Most industrial companies recognize the pyramidal costs that changes and delays cause on their own products. By this I mean: change a 75-cent resistor in Cabinet A and the costs multiply for *drawing changes, publications, provisioning lists, spare parts,* and field service bulletins.

Similarly costs pyramid for the simulator user when unscheduled downtime occurs. Figure 1 illustrates the point.

With the simulator down, maintenance personnel, either organic or contractor, perhaps both, enter the cost picture along with the spare parts requirements and associated administrative costs.

In the meantime, instructors are idle and the training schedules deteriorate. The most serious problem lies with the students - for with downtime, schedules must be altered incurring costs for administration, housing, travel arrangement, base and per diem pay. Availability or reassignment billets must be reshuffled to meet the altered training schedule. All of this is backed up with more students arriving or enroute to commence training.

Unscheduled downtime of the simulator is a major headache to the training command.

Three key factors are necessary to maintain the simulator as a viable substitute for the operational equipment:

(1) Device must be reliable and maintainable. The sophistication of today's training devices requires industry to re-evaluate the methods used by the customer in repairing the device. Built in Test (BIT) and Built in Test Equipment (BITE) procedures are becoming essential for organic maintenance personnel to keep the equipment on the line.

(2) Data must be fully representative of the hardware. Configuration Control, of both hardware and software, must

THE COST PYRAMID

FACTORS AFFECTING THE "DOWNTIME" OF THE SIMULATOR

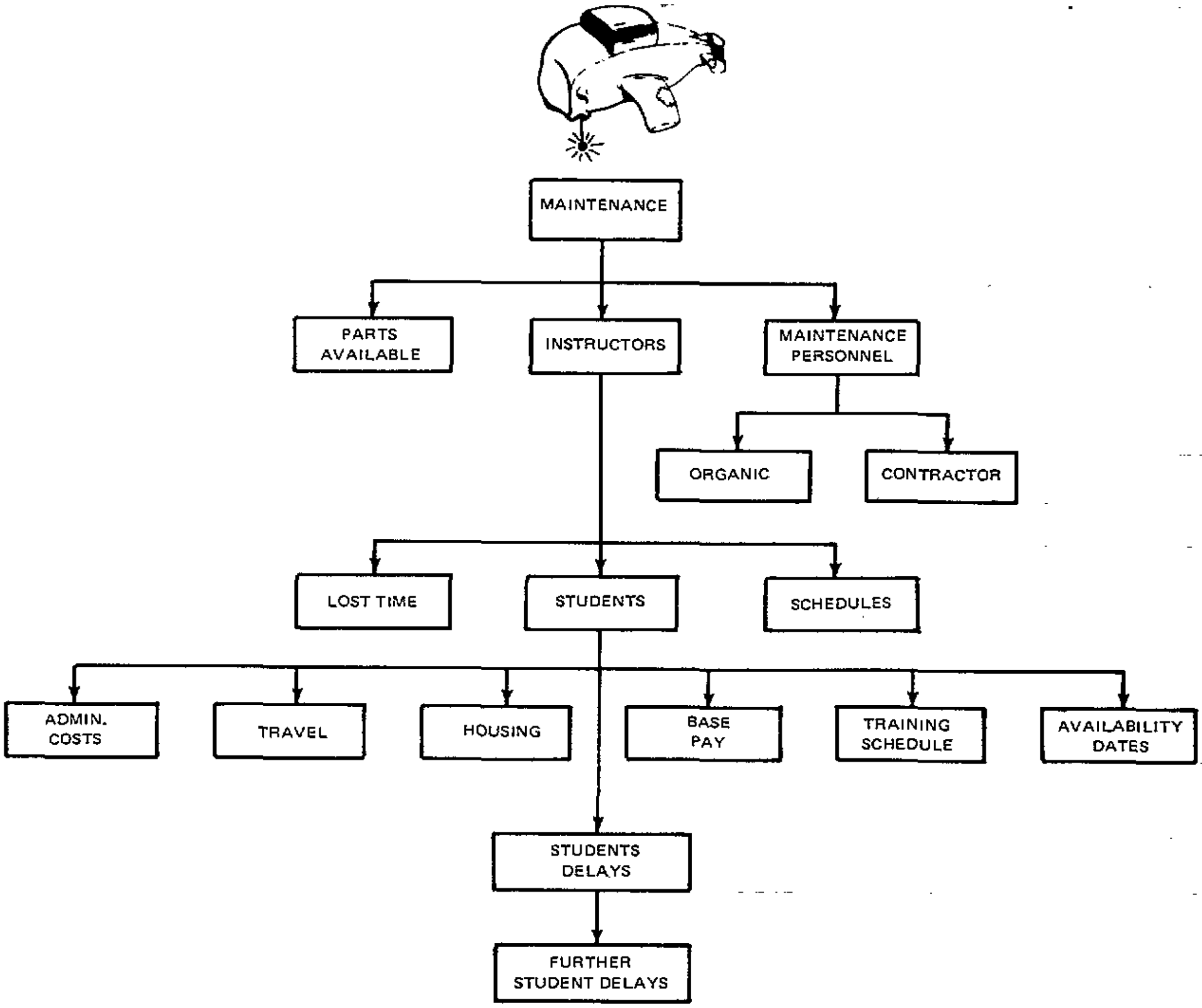

Figure 1. Cost Pyramid

be more rigorously applied and observed by the manufacturer. Likewise, changes made in the field must be carefully documented and appropriate changes made to all of the software.

(3) Spares. Without the proper spare part, of the correct configuration, available and ready for use on-site, Downtime Prevention literally goes "down the tube."

The Logistics Support Team, on the job from program inception through design and manufacturing, and following the equipment to the installation site, can ensure that the Logistics plan is properly implemented, monitored, and carried to a successful conclusion. The Logistics Support Team, fully supported by progressive management, will ensure that the equipment is reliable and maintainable, data and hardware are configured properly, and spares are available at the right time and at the proper site or depot.

The Logistics Support Team, properly trained and motivated, can make the difference.

New Factors In Logistics

As I mentioned in my opening statements, DTC and LCC introduce new factors in the Logistics discipline which will have a profound impact on the methods used to develop a simulator.

It is not my purpose today to expound on the good or bad aspects of the LCC philosophy - except to alert industry and government representatives alike that LCC may well require changes in the modus operandi.

The goal of LCC is to create an optimum system or equipment that will meet the designated specification and that is most cost effective over its planned life cycle.

A continuous dialogue must be established and maintained between designer and logistician as an inherent part of the system development.

This type of relationship will maximize possibilities for early identification of problems, thus forcing design-versus-support tradeoff decisions before the design is finalized. Obviously, design is paramount to the cost of ownership. The current Logistics Support Cost (LSC) model supplied by the government to contractors will both assist them in the design process and provide a relative measure of ownership costs.

A new design concept may have to be aborted occasionally in light of the support requirements on a program since, in the tradeoff studies, requirements for increased inventory management and new or modified support equipment could very well offset the gains resulting from the new design.

The cost drivers are inventory and maintenance manpower costs. Anything that can be done to a design to reduce the range and depth of inventory that must be carried as spare or repair parts or that reduces the time required for preventive or corrective maintenance will reduce the cost of ownership to the user. Whether it is an overall benefit to LCC is the subject of trade-offs with the cost of acquisition.

A simplified, but basically true, example illustrates the point:

If you were to create a new dash number for a PC Master Controller Board, it would cost the user approximately $4,000 over a 15-year life cycle. Add one new component to that PCB and you have doubled that cost. The PCB is also an item of supply at each base for remove and replace, so add about $5,000 more. If it is also repairable at the base, add $10,000 more. A simple dash number change and adding one new component, and you have caused user expenditures in excess of $23,000.

Let's assume that same PCB has a failure rate of once every four years. That means we can expect three failures during the 15-year life cycle. The predicted average MTTR is approximately one hour.

Each failure directly affects at least three people: the student pilot, the instructor, and the maintenance man. Manhour expenditures also occur in obtaining the replacement PCB, documenting the failure, and repairing the failed board.

The total cost of one failure every four years on PCB's located at 6 bases (assuming 6 simulators and 12 master boards per simulator) equates to approximately 700 manhours. At $20/hour, the cost is approximately $14,000.

From a cost of ownership standpoint we have committed over $37,000, and have not even considered the cost of spare/repair parts, support equipment, or training. Those $37,000 are trade-off dollars. Can $37,000 be spent on design to reduce the cost of ownership by $37,000? If the answer is yes, then LCC is being optimized.

Numerous considerations must be exercised during the design process. Each affects the cost of ownership for the user (customer). The overall ranking of these considerations can range from significant to minimal. Here are a few examples:

(1) New design versus old - new national stock numbers and inventory management are expensive. New design impacts all LSC elements.

(2) Repairable versus throwaway - throwaway may be cost-effective for operational weapon systems, but it seldom is so in the simulation world.

(3) Mean-time-between-failures (MTBF) and Mean-time-to-repair (MTTR) - significant since they directly influence the number of people required to support the product. Personnel costs in the services have greatly increased, even though the number of personnel is less. Indirectly, MTBF and MTTR influence the cost of spare/repair parts, publications, support equipment, training, and even facilities. However, over-design can be just as bad as under-design.

(4) BIT/BITE versus AGE (test and support equipment) BIT/BITE should be maximized for fault isolation and improved availability. AGE is expensive when considering multiple procurements at scattered bases. BIT/BITE also improves MTTR through more rapid and detailed fault isolation.

(5) Level of repair - the cost of repair at the depot level vs. organizational and intermediate levels varies with the complexity of the equipment and the repair parts which must be stocked at each base along with any peculiar test/support equipment.

Design can no longer be directed toward just meeting the specification requirements. Considerations must be given to the user's cost of ownership over the life cycle of the design.

I have presented a very broad overview of some of the factors of the DTC and LCC systems. Seminars are being conducted all over the nation covering these subjects and I might suggest that industry attend and support them.

For the contractor, I suggest the following areas may have some impact on operations:

(1) New and revised designs will have to be approved by Logistics.

(2) Improved engineering knowledge for Logistics personnel will be essential.

(3) Cost/pricing structures may have to be revised in order to correlate Logistics Support Costs.

(4) Technical and Cost Proposals may have to reflect very clearly how the contractor truly believes his equipment will perform.

(5) RIW (Reliability Incentive Warranties) may increase the liability of the contractor enormously - if the equipment design is not adequate.

(6) Organizational structures may have to be modified.

"Downtime Prevention" Starts With the Buyer

"Downtime Prevention" should become the "Cost Driver" in a simulation program. Downtime Prevention is the buyer's obligation as much as it is the seller's. I would like to briefly discuss several areas of potential improvement that could be instituted by the buyer and which may result in the savings of many dollars not only in the initial procurement, but during the life of the equipment.

(1) Application of MIL Specs - RFQ's and resultant contracts still contain "specs by the pound." Many of them are not even particularly relevant to the procurement of simulation equipment. I suspect many specifications are included in the RFQ package only because they were included in the preceding RFQ for another simulation device - and what was good for one must be good for another. I suggest a hard look at the spec requirements by the procuring agency and the operations people before issuing the RFQ.

(2) Commercial Components - The overall Logistics problem could be made substantially simpler and less costly by the increased use of proven, reliable commercial components and equipment. Test equipment is one specific area where the use of commercial off-the-shelf equipment should be further explored by the military. Recently, at an Army seminar, we witnessed an example of two pieces of test equipment side by side - one a commercial unit - the other militarized with all the accompanying specifications. Both pieces performed the same job - however, the military version, after being ruggedized, fungus proofed, waterproofed, drop tested, etc. - could no longer fit through a hatch in an Army tank where it was required to be used.

(3) Spares - The identification and selection of spare parts is a tedious, time consuming and costly task. The spares provisioning conference also performs a service to the customer of which he may not be aware. It serves to point out the potentially weak areas in the equipment design.

However, if we are to keep the simulator on the line, spares must be determined, selected, procured and the contract negotiated in a more timely fashion.

If more commercial, off-the-shelf type components were used in simulators, "downtime" could be improved by permitting military personnel to procure components at the local Radio Shack outlet.

The Logistics Support Group Can Do More -

From the contractor's side of the Downtime Prevention problem, I would suggest that the Logistics Support Group can do more if one or more of the following were selectively reviewed in-house:

(1) Organization Structure - It is very probable that many companies represented here today have created organization structures in order to do business with the Government. Logistics groupings may have been one of these organizations. I suggest that a review of your organizational structure may result in a more homogenous grouping which will better serve your company, as well as the customer, and provide a better means of support for the equipment.

(2) Personnel - A well known commercial company uses the slogan, "The Quality Goes In Before the Name Goes On". We might well keep that in mind when selecting personnel for the Logistics Support Team. Maximum availability of the simulator may require upgrading and retraining of Logistics personnel - both in management and labor categories. Make the Logistics organization one that people will want to join.

(3) Design Approach - With the introduction of LCC requirements, it becomes necessary for the Logistics organization to have design approval. I would suggest that this requirement be fully explained to all personnel active on a given program and then rigidly enforced.

(4) Computerization - Many of the Logistics functions such as provisioning, spares, AGE, Reliability and Maintainability are heavily concerned with statistics and/or numerical and alpha listings. The manual inputting and correlating of Logistics data is not only time consuming, but costly.

If you have not already done so, I would strongly urge you to apply some of your best software people to the task of computerizing the Logistics data tasks. A couple of good programming people in your Logistics group could conceivably save you and your customers a considerable sum of money.

(5) Consult Your Customer - Insist on your Logistics team going to the field. Interview the user of your equipment. Find out what support data he really uses to maintain the equipment. See which documents, such as maintenance and operation manuals, have dust on them - and find out why. In this manner, you can help the customer and yourselves and perphaps reduce some of the unnecessary requirements of simulator contracts.

Summary

To summarize my remarks, may I simply state that if simulation is going to fully answer the resource conservation problem, Logistics must and will play a much greater and more important role in the overall procurement process.

Logistics can no longer be a "Tail-end Charlie", but must be fully involved and cognizant of the front-end planning and design of simulation devices and must continue through the entire program to monitor and implement the action to prevent downtime from wasting the resource.

DTC and LCC can be useful resources to both buyer and seller if they are administered uniformly and properly. If allowed to proceed in an uncontrolled, free-running state, they will serve no one, but will develop another "cultism" to swell the administrative tide.

Industry should respond to the need for more reliable and maintainable equipment by developing a sound Logistics organization capable of implementing and following through on good, common sense, economical Logistics plans.

The military buyer must be amenable to buying less than the "gold brick." I strongly urge that the wholesale proliferation of specifications used on government contracts should be sharply curbed.

The use of established, reliable, commercial off-the-shelf products should be encouraged. Methods should be developed by the military user to enable procurement of commerical components in local areas.

Simulation devices are important tools to our nation's defense - not only as a method of conserving our national resources, but as a viable substitute in keeping our armed forces "mission ready."

Logistics can make the difference.

ABOUT THE AUTHOR

MR. DONALD E. TUCKER is Director, Integrated Logistics Support, Flight Simulation Operations, Link Division, The Singer Company. Primary responsibilities involve all of the logistics functions and include reliability, maintainability, publications, provisioning, spares, training, interim field support, and logistics support management. During 19 years with the Link Division, Mr. Tucker has served in virtually every discipline in the Company. He has been manager of bids and proposals, engineering administration, quality control, product assurance, ILS, commercial products, and chief program manager. His most recent assignment had been Executive Assistant to the Vice President and General Manager of the Flight Simulation Operation. Mr. Tucker was educated at the University of Scranton. In addition, he has participated in many company-sponsored and professional management programs.