# APPLICATION OF THE CILOP PRINCIPLE TO SIMULATORS

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The acronym CILOP was coined by the Department of Defense just a few years ago. It stands for "Conversion in Lieu of Procurement" and was an attempt to decrease the cost of new programs. Although the acronym has almost faded into oblivion, the concept remains both valid and active.

The basic principle behind CILOP is to decrease the cost of programs by modifying existing systems rather than starting from scratch. This principle moves along two separate and distinct tracks, both starting from a common point but traveling in different directions.

The first track is a method of procurement with the objective of reducing costs associated with new contracts and the competitive process. Under this procedure, new requirements which become evident while a contractor is working an active program are added to his existing contract as an engineering change proposal (ECP). This eliminates lost time and the expense of contractor and proposal evaluation. The required paperwork for initiation of a completely new program is also eliminated. The principle has worked well for minor requirement changes, but its application for major changes has not been successful over the long term for either contractors or for the Department of Defense.

The second principle in the "Conversion in Lieu of Procurement" concept is what I like to refer to as the "building block" concept. Under this principle, a new product is procured only if an existing product cannot be modified to provide the required capabilities.

This concept embraces the basic principle of modifying present equipment to accomplish the same task as new equipment.

This aspect of the CILOP principle, very much in use, is also known as simple modification. It is used on prime systems as well as simulators and training devices, and is not confined to military sales but crosses the full spectrum of government and commercial markets.

Modification of prime systems has been occurring at an increasing rate over the past several years and promises to be just as active in the future. The nature of confrontation between two adversaries in a modern, technologically active environment is continual change by one side followed by change on the other side. The electronic warfare field is a perfect example of the ever changing environment. Technology has reached and surpassed the point of hardware only systems. The advent of software programmable signal processors and microprocessing techniques gives the user a capability to rapidly change his capability in response to new intelligence.

The expanded capability has led not to a decrease in new systems being purchased, but to an increase in the number and speed of modifications on older systems. The same principle is applied to our everyday commercial systems also. Each of us, except for our oil rich neighbors, will modify or repair our older vehicle before we scrap it for a new automobile. The same principle has been used in aircraft procurement for years. When the threat changes, we modify the aircraft subsystems to accommodate the new protection requirements. The aircraft is scrapped only when the modification would seriously degrade the flight envelope, or the airframe itself would no longer accommodate the necessary change.

The F-4 is an excellent example of an airframe which has been

continually modified with electronic countermeasures equipment to keep current with the changing threat environment. As a result, the F-4 has been a front-line aircraft for well over ten years and is only now being replaced by a new aircraft.

This same CILOP principle also applies to simulators which brings us to our primary topic. In the simulator procurement and modification market, the first CILOP principle, sole-source contracts, has actually had more application than the second principle. Perhaps this is due to the small costs of simulator modifications compared to the cost of prime systems changes. In either case, there is good reason for following both principles.

When a modification is made in a prime weapons system, the change must follow in the simulator. The changes in the simulator should emulate as closely as possible the modifications in the weapons system and should be made in as timely a manner as is possible. The amount of time available from definition of the prime system change and incorporation in the platform is not always sufficient to allow for a competitive procurement procedure. The simulator must keep pace with the weapons system or negative training will result. Therefore,although simulator contracts have not been open-ended with ECP action, a common route to modification, sole-source procurement has ocurred to a great extent. This has saved the Department of Defense money in most instances and resulted in good products that respond effectively to prime system changes.

The second principle, modify rather than buy anew, has been used successfully in the Electronic Warfare (ECM) Trainer field. Since ECM is the fastest changing medium today for the DOD, the B-52 ECM suite appears to be the best example to use to explain the pros and cons of this principle in simulator applications.

As an introduction to this simulator, I should mention that the present B-52 ECM suite utilizes a conglomeration of receivers and jammers that cover the full spectrum of the enemy radar environment and utilize technologies covering the time period of 1960 through 1978. This collection of systems are loosely tied together in an integrated system with the Electronic Warfare officer as the central manager. Due to this loose association of equipment, an individual system can be easily modified to accommodate the changing threats with no effect on other systems.

The cost effectiveness of modification or replacement of individual equipments on the B-52 becomes strictly a question of capability desired. The simulator is a completely different problem.

The B-52 EW simulator is the AN/ALQ T4. As originally designed, the T-4 was an analog system utilizing technology that was current in the early 1960's. When the first modifications in the aircraft's ECM suite were initiated in about 1965, it was decided to upgrade the T-4 rather than to procure a new simulator. Similar decisions have been made with each aircraft change to date.

In the process of modifying the T-4 to simulate new aircraft equipment, the analog equipment has been upgraded to a digitized system. This conversion effort was in part necessary to accommodate the new demands placed on the equipment and partially due to a natural evolution in technology. The new technology was automatically incorporated with each modification as a life-cycle cost savings procedure, as a result of adding state-of-the-art techniques to each modification effort. The finished product is inherently more capable of performing the required tasks, is more flexible in accommodating new requirements, and has resulted in keeping the training concurrent with operational equipment.

Virtually all systems are controlled and monitored by a central computer. Modifications within a system can easily and quickly be accomplished in the simulator by a software formulation change. The addition of a new system aboard the B-52 can be accommodated in the simulator by changing the software and adding hardware. The less costly route has always been a simulator modification, rather than an altogether new simulator. This route has proven successful for the addition of the ALQ-117, ALQ-122, and the ALR-46 equipment, as well as the conversion of the older ALT-13 transmitters to ALT-28s and finally, to an ALQ-155 Power Management System. This "Conversion in Lieu of Procurement" practice has worked well for the T-4 simulator and, although it has predominantly been a sole-source procurement program, key modifications have been open to competitive bid.

By looking closely at the advantages and disadvantages of buying new instead of modifying, we can build a strong case for the CILOP principle. Seven points appear relevant:

1) Percentage of change

2) Schedule

3) Operational training loss

4) Risk

5) Maintenance training/support equipment

6) Investment

7) Costs

These seven points should be evaluated in detail for each new simulator requirement when an existing simulator is already operational.

The first point, percentage of change, should be measured twice. If the simulator change is minor, should not the present equipment be modified rather than rebuilding the device from scratch? The basic system hardware is there and the technology will not change. Why re-invent the wheel? On the other hand, if the changes are in fact major, and the entire student booth/instructor station/and integrating circuits need changing, perhaps starting over is a proper and cost-effective approach. The second measurement is made after production of the new prime weapons system is complete. Are further modifications likely to occur which will require simulator modifications? Will these modifications have dire effects on the simulator, or can they be incorporated easily? In the EW trainer, the answer differs for the two measures. No, the requirements for change are not so radical to cause a complete change in the current simulator. The T-4 can be updated without excessive cost by adding software and hardware changes to incorporate all the new training requirements. The second answer is "yes", modifications are envisioned far into the future. Any new trainer must remain easily modified to adhere to modification time and cost constraints.

The second and third points to consider are schedule and training loss. Anytime a new simulator is procured, there is a time lag from when the simulator is ordered, initiation of the prime system modification, to the delivery of a fully operational trainer. This time lag results in a definite loss of training, which can be catastrophic during tense world situations. The finished simulator product must accurately reflect the actual aircraft operation. In the case of ECM systems, the full integrating effects of new equipment has never been accurately definitized before the prime system has become operational. Can a new simulator afford to wait until the prime system is flying and then start development? Does the new simulator go into production and then retrofit after the prime system is operational? Either way, training time is lost. In

the conversion concept, training continues and, since the modification may be only minor hardware change, the simulator can be updated very quickly after the prime system is finalized.

Risk is the fourth point and is very subjective. Assuming a new simulator procurement is not a redevelopment of the wheel, how much risk is involved in the development process? If training is relying on the new simulator within a key specified time period, what confidence factor will be applied to the new approach as to meeting the time schedule with the required operational capability? The risk is high with any new system and will increase dramatically with the amount of sophistication required. Modification of an existing simulator does not entail the same risk even though the final product will be the same. The existing simulator is proven. Only new portions of the hardware or software would have any attendant risk factors.

The fifth point is related more to overall program cost and personnel utilization than directly to the contractor charges. Procuring a new system usually requires new or different accompanying maintenance equipment. In addition, the maintenance personnel will require retraining in the total system and will still be relatively inefficient for a period of time while their experience level builds. A critical point is whether sufficient personnel resources are available to support a large program or will contractor support at additional cost be necessary.

Investment is the sixth point and requires extreme scrutiny. With tight budget dollars, scrapping or discontinuing the use of a good working system must be thoroughly justified to prevent serious loss of confidence by the public and, thereby, an ultimate loss in new year funding. The question of when an older system is no longer usable is totally dependent on mission and maintainability costs. If the mission has not changed and the maintainability costs have not risen sharply on an operational simulator, why risk an untried new device?

The last point and the one which will normally receive the largest percentage of attention in simulator procurement is cost. How much is the new system and what is the difference in cost between a new system and the modified existing simulator? The importance of cost and the relative evaluation points assigned to them is purely subjective.

At what point does the defense establishment opt for a new system rather than for conversion of an existing device? Where is the line drawn and how is that line justified? Is there a CILOP checklist which includes the seven points we discussed or may be respectfully submit these seven points as a starting point?

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