ADVICE TO THE SERVICES

General Paul F. Gorman, U. S. Army (Retired)
Salt Lake City, Utah, 18 November 1986

My purpose is to remind both the services and industry of the record of training development as a subset of weapons system development, and to suggest that the future will be both intolerant of the inefficiencies which have plagued us in the past, and receptive to the new approaches which technology makes possible. The challenge before this assembly is to understand our basic imperfections, and to adopt a strategy for amelioration.

NNN 57

CHALLENGES

- WHERE SERVICES HAVE BEEN
- STATUS
- IMPERATIVES FOR PROGRESS

CHART I

I do not need to remind this audience that the services have been wont to manage weapon systems development by giving priority to the development of the materiel itself. That priority has been almost always absolute: that is, resources are allocated first to building the weapon, and if at any time in the course of development the arises a requirement to reconsider how to spend available funds, the weapon itself is last up for shaving expenditures. The logic of this choice has seemed impeccable. After all, consideration of how to maintain the materiel, or how to handle it operationally can only be addressed after the materiel is a reality, with all the engineering bugs and modifications worked out, at least to the extent that the final configuration can be shown to training developers. Hence, the

usual development follows this course:

CHART 2

The first increment of money and time is almost invariably set aside for building the weapon itself. As the materiel development matures, attention begins to focus on issues of maintenance, and a maintenance subsystem begins to emerge:

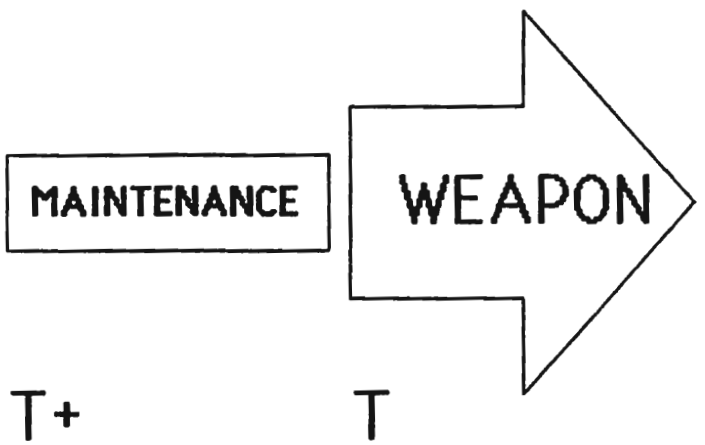

CHART 3

When it is clear what the configuration of the several man-machine interfaces within the system consist of -**then and only then**- training developers are brought in to devise ways and means of introducing the materiel to novice operators and maintainers, and the training subsystem emerges:

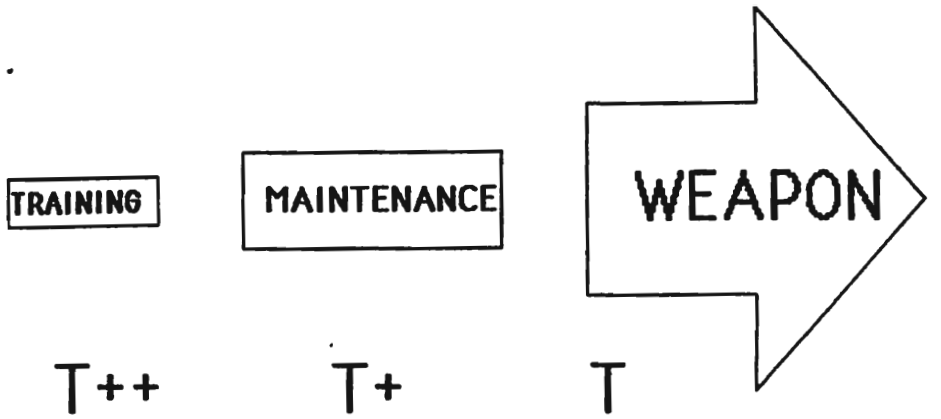

CHART 4

By now most of the time available before the decision to field is taken is expended, and most of the cost of procurement has been incurred. Hence, the usual paradigm for weapon systems development features a relationship between cost and time something like this:

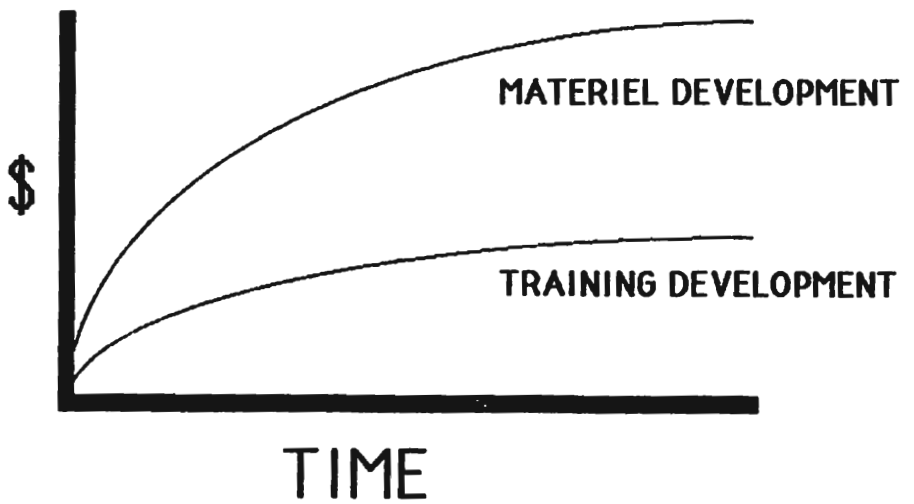

CHART 5

This chart displays verity: most expenditures for materiel development come early in the procurement history. Outlays for training lag in time, and are substantially less than those for the materiel itself.

If this old soldier could be permitted one burst of advice for those who presently make the decisions within the armed services affecting such matters, it is simply this:

DON'T DO THAT

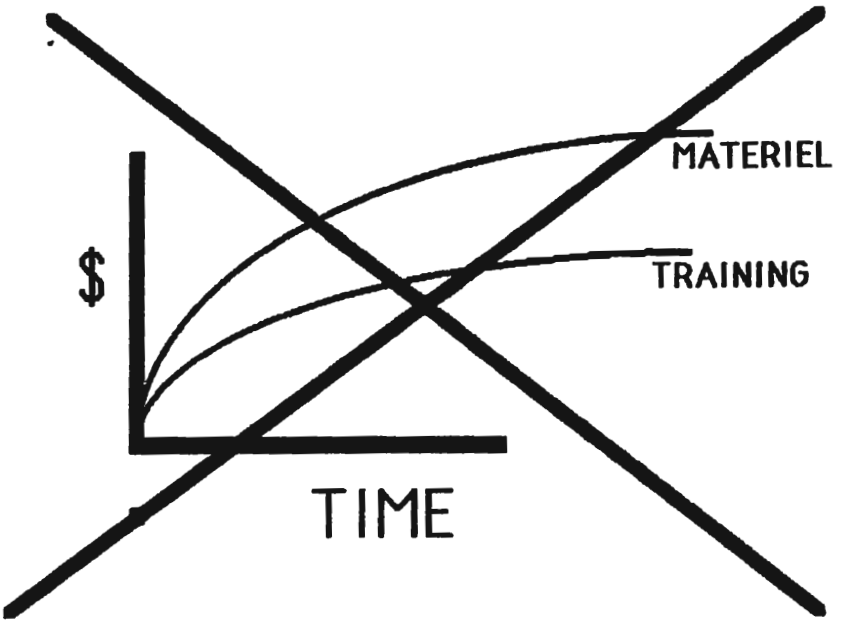

CHART 6

The first Law of War is *DON'T DO ANYTHING DUMB.* It is increasingly evident that modern technology makes its possible to adopt a more cogent course of action during development, one in which the uncertainties regarding the man-machine interfaces can be resolved **before** decisions on the configuration of the weapon itself. It it also evident that such an approach can help prevent very high life-cycle costs driven by maintenance difficulties, or requirements either to man the system with Category 1 personnel, or to subject them to costly training. Indeed, the operational readiness of many contemporary systems tends to be driven by shortcomings of maintenance or training, as opposed to materiel design.

Let me pause a moment to address any in the audience who may be sceptical that we have in fact treated training so cavalierly in the past. One of the more elegant pieces of contemporary advanced technological planning is U.S. Air Force Project Forecast II, in which that service sought to select its developmental paths into the Twenty-first Century. But I was struck, and I am sure you would be also, at the degree to which even very elegant projects for rendering technology subservient to human sensory, behavioral, and decisional requirements relegate training to the last step in projected development. (I'll cite in a moment some examples from Forecast II). This propensity to defer hard questions on the human dimensions of

weapon systems is one of deficiencies which led the Packard Commission to recommend early prototyping as a central remedy to the malaise within the Department of Defense's procurements as a whole. Like my fellow Commissioners, I became convinced by the evidence placed before us that money wasted by inept treatment of the man-machine interface far exceeded amounts lost to clumsy contracting, or even fraud.

Moreover, it is important for this audience to understand that a "prototype" is, in effect, a *simulation* of the weapon system in its final configuration. The time to begin training and maintenance subsystem development is as early in the development cycle as possible, certainly as soon as some form of the eventual system can be presented to training developers. Accordingly, the paradigm recommended by the Commission would look something like this:

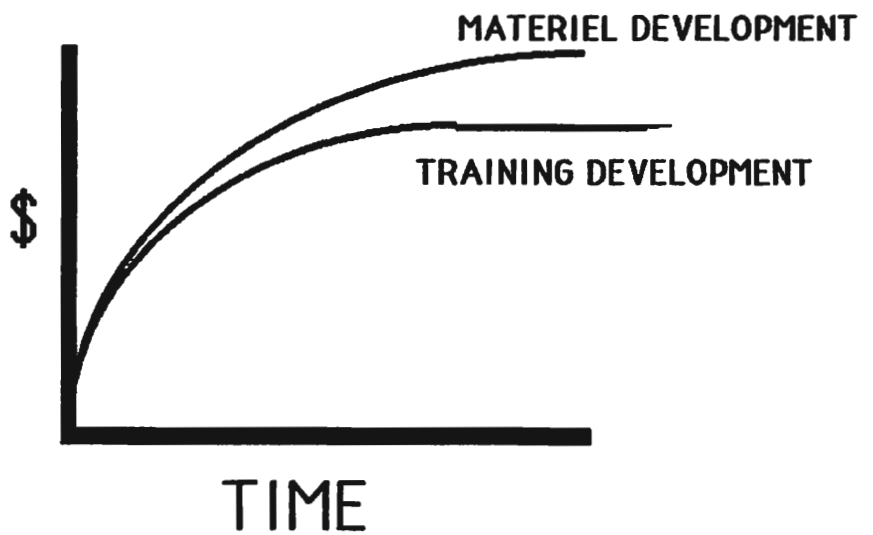

CHART 7

What is portrayed here is contemporaneous development of the training subsystem and the materiel subsystem as a product of early prototyping, and consequent timely identification and addressing of man-machine interface problems.

My argument is not only that life-cycle costs will be lower for weapon systems thus developed, but that it even possible today to predict more surely than ever before what the eventual system should look like by starting first with development of the

training subsystem. In Project Forecast II, the Air Force has called for development of a "rapidly reconfigurable cockpit," a simulator which could provide experiential data with typical pilots manipulating controls and responding to sensory inputs from a cockpit the design of which could be changed within a matter of hours. Forecast also make evident that the Air Force has in mind heads-up helmet displays which will almost entirely supplant actual vision with presentations derived from sensors on board the aircraft, digital terrain data bases, and exogenous data sources. Such a digitally generated visual display ought to be significantly easier to simulate, given the advances in processors anticipated by the previous speaker. In short, as I read it, one important thrust of Project Forecast II is to enable a whole new range of powerful simulators.

And, lest you believe that the Air Force is alone in such endeavors, let me remind that the U.S. Navy derives today useful information concerning the configuration of tactical command and control from simulators in use for training at Norfolk, and that the U.S. Army is similarly dependent on battle simulations -models of conflict used to drive command post exercises- for defining its future command and control systems.

My own conviction is that all responsible for weapon system development ought now to consider adopting a strategy predicated upon this construct of the development process:

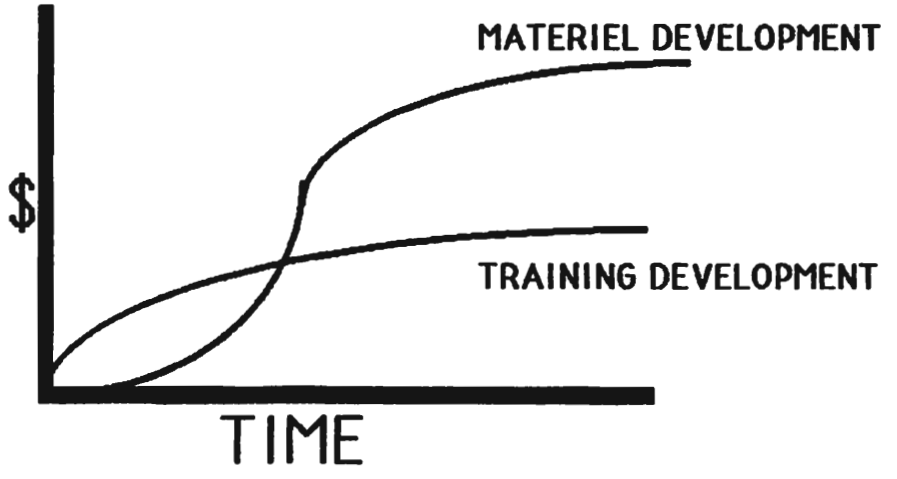

CHART 8

Before we begin bending metal on any weapon system, we

ought to build a simulator, or multiple simulators, which would permit us to explore its tactical utility, and it man-machine interfaces, and to gain insights concerning its basis of issue, its configuration, and its responsiveness to human control.

Is it realistic to expect that such will be possible? I hope that what you have heard thus far, and what you are about to hear, will leave you as convinced as am I that to do otherwise would violate the first Law of War.