

# Training For High Technology\*

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## Introduction

It is a platitude of the military profession that your armed forces are a reflection of the society from which they spring. American society is in the grip of powerful forces for change, including the impress of high technology. And platitude or not, there really are striking parallels between the impact that these changes are causing within the armed services and within the nation at large. The new technologies have altered the international environment, not only for our large corporations but also for our armed forces. To remain competitive American business has to reach ever more broadly for high technology; so too with the armed forces. And if it is true that the American workforce is being transformed from one in which most employees were engaged in the production of manufactured goods to one in which most are providing services, so too your armed forces have been transformed, within this generation, from a labor-intensive undertaking to one which is highly capital intensive, and in which most servicemen and women are engaged not in combative roles, but in jobs analogous to those in the service industries.

In fact, looking back over the development of U.S. military organizational theory during the 20th century, I see generals and admirals pursuing wittingly or unwittingly the approach commended by Frederick W. Taylor for the steel industry. Just as industrialists at the turn of the century had to push aside the remnants of the craft ethic in order to adopt organizational forms and technology which would enable American steel makers to compete with the Europeans, so leaders of the US armed forces had to assert the primacy of a general staff over the prerogatives of individual arms or independent bureaus to produce forces relevant to the threats to national security obtaining at the time. Just as Frederick Taylor advocated moving the brain-work and decision-making to the top of the industrial organization, and designing the hand and muscle work at the bottom for minimum discretion, so the leaders of the armed forces of World War I and World War II welded together the chain of command and prescribed roles for the mass of lowest ranking enlisted men which were by design intellectually confining, requiring only minimal training. The soldier, sailor, and Marine, like the industrial worker, were treated as replaceable parts in a large machine. While I don't want to overdraw the point, I would call your attention to the fact that the training techniques which have been employed by the armed services for most of this century resemble

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nothing so much as a large-scale sausage factory, designed to produce a high volume of identical products by stuffing skills and knowledge into trainee heads in factory-like training centers with assembly line-like educational techniques.

To be sure, just as American industrial management yielded to labor union pressures, the armed forces in the aftermath of World War II responded to urgings from outside to pay a great deal more attention to the needs and aspirations of lower ranking servicemen and women. But the armed services remain structured today essentially as they were structured during World War I. In fact, one could make the case that, if anything, power in the armed forces is concentrated centrally more than before, and the latitude permitted at bottom is more narrow than ever. Indeed, most high technology weapon systems being adopted today have been accompanied by representations from their designers that the man-machine interface, as it is called, has been so engineered that requirements for broad sentience and initiative on the part of the servicemen operating or maintaining the system have been reduced significantly compared with predecessor weapon systems.

### **Minimizing the Hierarchy**

Here the industrial analogy would offer a warning for the armed forces. Research has been shown repetitively that high technology industries-undertakings with a large amount of automation, such as oil refineries, paper and pulp mills, and food processing-function best with a minimum of hierarchy and a maximum of teamwork at the lowest levels. According to the work of Woodward and others, unless those closest to the machines have the training and the authority to recognize problems and act quickly, mishaps can destroy costly equipment.

After the Three Mile Island nuclear incident, the Kemeny Commission found that a key cause of the near disaster was a rigidly hierarchic management, and lack of training for lower-level, on scene personnel. General Foods designed its Topeka plant in 1970 deliberately to cut down on management and to assign management-like functions to ordinary line workers.

Moreover, there is a broad thrust in industrial research demonstrating that firms who have adopted so-called "participative management" systems have proved to be more productive and appealing to this generation of more educated workers. Of course, this approach is what the Japanese have moved into during the past decade, enabling Japanese companies to produce automobile and electronic products of higher quality and lower cost than comparable U.S. products. Japanese companies have minimized specialization, emphasized broad training, encouraged functional flexibility, and delegated low level authority -for example to stop the assembly line to remedy poor quality- and encouraged the foundation of shop management groups or "quality

circles" trained to identify and solve production problems. In contrast to the notion of a "big brain" at the top controlling the whole organization mechanism, the Japanese opted for many "little brains" in the interest of improved quality and productivity. On the whole, their track record has been very good. Good enough, at least, to cause American management seriously to reconsider its top-down approach to management, and to experiment broadly with decentralization and worker involvement in management based on trust from above, and worker adoption of common goals and explicit standards. All of this has thrust upon American industrial managers entirely new roles for which they are quite unprepared by education or experience.

### **Armed Forces Adaptation**

Again, what has been happening the while in the armed forces is analogous. Like American industry, the armed forces do not have the option, if we want to stay in the business of providing national security, of refusing the new technologies. The problem, rather, is how shall we adapt to them. Now, that problem presented by high technology is not understood very well within the forces themselves, within the Congress, or within the public at large. Most believe that the services are procuring expensive equipment which is overly complex because of high technology, which we are forced to put into the hands of even more expensive volunteer servicemen, who, to put it bluntly, are ill-educated, stupid, poorly disciplined, and resistant to training. Those who are led by the media to believe that this is the case might readily accept the proposition that the nation should immediately return to conscription for its military, or adopt other even more onerous sociological solutions to assuring high quality personnel. I happen to disagree fundamentally with this characterization of the problem engendered for the armed services by high technology, and so I am not prepared to endorse any of the recommended solutions. My own reading and experience would lead me to believe that our problem is not unlike that of American industry, and that many of the concepts and techniques which have been useful in enabling industry to make its workforce productive are quite applicable to the armed forces. Now I hasten to say that I understand full well, having experienced them at firsthand, the differences between the assembly line and the firing line. And I do not advocate replacing "duty, honor, country" with "hustler" ethics. But it nonetheless seems to me that leaders of the armed forces would be well advised to study what is going on within high technology industry with a view to appreciating better what is happening to them, and what they should do about it.

### **Changing Traditional Structure**

To begin with, I am confident that we should rethink our traditional hierarchy of command. The rank structure of the armed forces has changed little since the Civil War, and a force structure from other eras seems to me to

be maladroit for the future. I have suggested to my colleagues, indeed, that it might be useful to think of the armed forces as composed of a hierarchy with only three general differentiations: planners, operators, and doers. By doers I refer to single-function managers, individuals or small groups whose purpose is focused on one machine or one specific task or mission. By "operators" I mean multi-function managers, individuals or groups who supervise and control the interaction of the doers. By "planners" I refer to those for the future. Indeed, as British management theorist Elliott Jaques has shown, the leadership echelons of any large organization are best described by the time-horizon governing their separate endeavors. Doers need not, indeed cannot, be concerned for much more than the immediate future. Operators have to take a longer view, particularly where there are sequences involved in their combining the efforts of the doers. And planners must have the longest time-horizon of all. Jaques' research suggests that there are definite parallels between traditional industrial corporate structure and military organizations of comparable size which neatly fit his time-horizon differentiations. I make these points simply to enable me to assert that problems of training for high technology in the armed forces are least for doers, an order of magnitude greater for operators, and yet another order of magnitude greater for planners. Dr. Michael Maccoby, who has studied industrial sociology extensively, identifies the education of managers as the greatest single bar to enhanced productivity. In his interviews he has discovered that American managers at what I have termed the "planner" echelon believe that they require more education, new training. Most of them, he reports, will say something like: "the very qualities which got me to this position are the ones least applicable to my job today."

It is my contention that the same thing is true in spades in the armed forces.

The military profession probably pays more attention to the continuing education of would-be senior practitioners than any other. In my own career, I have spent fully one-third of my professional years in school, serving on a school faculty, or supervising school faculties in a direct sense. And yet, like Maccoby's interviewees, I and most of my colleagues arrived at the top only to discover that our education had been largely irrelevant to the problems at hand. Now it is not just that the new technologies themselves are beyond our ken, or that ethics of modern youth are alien to our own, or even that the Congress has thrust upon us unanticipated wholesale experiments in social mobility as well as responsibility for the security of the nation, it is the whole nexus of rapid change in the international environment, in the evolution of threat forces, and in the ever more extensive web of law and regulation which defines and constrains senior officers, all interacting, which lead me and many of my colleagues to conclude that of all the problems of training for high technology, the training of generals and admirals should receive attention as a matter of first priority.

## "Capstone" Course

The Joint Chiefs of Staff recently directed the formation of yet another professional school, this one designed as a so-called "capstone" course, for the preparation of officers selected for promotion to brigadier general or commodore. Some observations about that course, which has just been launched this month, are very germane to this gathering. In the first place, the course was conceived as a traditional schooling program, with the students collected at one location on the assumption that there were major educational benefits from intra-group socialization. The original plan would have had the group then travel extensively, visiting the several headquarters of the armed forces both here in the continental United States and abroad. Considerations of cost and efficiency soon brought about revisions in this curriculum, with much of the travel being excised, and television tape interviews with distant commanders being substituted for the visitation to his headquarters. Also, all of the services encountered difficulty in scheduling those who should have received the course for the requisite three months in Washington. As might be expected, selectees for promotion to flag rank are key men in their organization wherever they may be, and it proved difficult to break them loose for an extended absence from the job even for a *ICS* approved program of instruction. Those of you who have been working with management training in industry will immediately recognize these problems, and will appreciate that we have as yet scarcely scratched the potential of modern communications, such as teleconferencing, to alleviate the difficulties which have obtruded thus far in the *ICS* training program.

## School of Management and Strategic Studies

Recently over at the National Defense University, Dr. Richard Farson of the Western Behavioral Sciences Institute demonstrated a different approach for training senior business executives. Dr. Farson's School of Management and Strategic Studies offers a two-year program divided into four six-month increments or courses dealing seriatim with the private sector and the state, with technological progress and people, with the management of scarcity and abundance, and with globalism and interdependence. The School attempts to develop within each student an ability to anticipate future needs, developments, and problems for more effective planning; to adopt values relevant to such decisions; to understand the larger environment in which the decision making will have to take place; and to enhance skills and the understanding related to the leadership of personnel involved in the enterprise. At the start of each six-month course, the students and faculty are brought together for an initial seminar which extends over two weekends and one included working week. The students and faculty then disperse, and proceed through the remainder of their common course work employing readings and interactions via computer teleconferencing. According to Dr. Farson the advantages for a busy executive are significant: in the first place the computer teleconferencing

permits him to involve himself in the course work whenever and wherever his business schedule permits. If necessary, participants can take their computers with them on business trips, and interact with the faculty and their fellow students from hotel rooms or branch offices. Moreover, says Dr. Farson, the course benefits from the fact that the students are actively involved in actual management undertakings, so that the anecdotal richness and timeliness of student comments, and the acuteness of student questions to faculty, are qualitatively different from what they would have been were the students altogether removed from their business for a period of study. I am instinctively allured to this solution as an approach to training senior officers of the armed services. Moreover, I know enough about the technologies of modern communication and the capabilities of military command control communications to be persuaded that the armed forces could readily improve upon the communications technology so far brought to bear by the Western Behavioral Sciences Institute.

### **Training of Operators and Doers**

But what of the training of operators and doers, to use my structural taxonomy. Here let me lapse into illustrative anecdote. In 1978, General Haig, who was then Commander-in-Chief in Europe, launched inspections into reports that the TOW anti-tank missile system in the hands of American troops had been allowed to fall into disrepair, and that in general, low quality doers had obviated all the trouble and expense the Army had gone to in introducing the system into the divisions deployed in Germany. [I am pleased to report that his inspectors found only minor discrepancies in the division which I commanded.] But the NATO inspection was limited to the state of the readiness of the equipment and the proficiency of the individuals who handled it on a day to day basis. It did not, in my view, explore the real difficulty we faced, which concerned operators, not doers.

You see, every weapon system has an effectiveness that is a function of three principal factors: (1) the capabilities engineered into the material itself; (2) the proficiency of the individuals who man the weapon, or those who maintain it; and (3) the tactics or techniques with which the weapon system is employed. It turns out, particularly in the case of the TOW, that much of the marvelous capabilities built into the weapon, no matter how proficient its gunners or mechanics, can be rendered useless by the tactical clumsiness of the leaders responsible for positioning it on the battlefield, or for integrating it with the fires of other weapons. We had put this powerful tank destroyer with a range of three thousand meters in the hands of infantry officers -operators- who had been conditioned by schooling and experience to be aware of two hundred meters. In short, I discovered that my fundamental training problem with the TOW was in training the operators -the officers and senior NCOs- to whom I entrusted it to use that system to its full potential.

To take another example, we were issued thermal imaging sighting devices for our anti-tank guided missiles. It was assuredly effective for that purpose, because it turns out that the sight afforded better visibility on the battlefield under all conditions of light -night, day, smoke or fog- than with our many optical sights. As a striking example of what operator ingenuity can do for a force, I am pleased to report that one of my subordinate commanders came to me with the proposal that we issue some of these sights to our artillery forward observers, pointing out that since much of our firepower was delivered through the artillery system, it behooved us to take advantage of this technology to improve its ability to see the battlefield. I wholeheartedly agreed.

In fact, actual experience as a commander coping with the infusion of high technology into a mechanized infantry division leads me to believe that the training of operators -the officers and senior non-commissioned officers who will use the technology- is the most important step which must be taken to modernize the force. Like the busy executives we were just discussing, those officers and those non-commissioned officers are needed in the force, and cannot be spared for formal schooling at some location remote from their units. They have to learn on the job. In contrast, the doers are usually trained in a formal course in a school or training center, and this often produces the phenomenon of skill inversion, with doers who know a great deal more about the weapons systems than the NCOs and officers in the hierarchy above them. The Army at least pays insufficient attention to this problem inherent to force modernization, and I have reason to believe that the same phenomenon occurs in the other services as well. Obviously, one solution is to exploit communications technology to take the formal training to the unit.

### **Engagement Simulation**

The mention of skill inversion brings me to my final point. My experience with high technology leads me to believe that orthodox service leadership may ignore creativity on the part of doers that could otherwise be turned to good advantage for the security of the United States. For example, in recent years, the U.S. Army has adopted a training technique called engagement simulation, in which, with lasers representing direct fire weapons, mock battles are staged in which casualties can realistically be assessed on both sides, and participants can thereby experience combat vicariously. This training technique includes an after action review in which all of the participants collectively identify what it was that was right or wrong about the way they went about executing their mission. Such invitations to rank and file to palaver over tactics has evoked criticism from some traditionalists within the Army, among them senior officers who are repelled by the idea of inviting enlisted men to comment on the tactical proficiency of officers. Of course, that tactical proficiency, or the lack of it, is hardly a matter that would remain confidential beyond the first few minutes of the first real battle, and it is my view that it is

very healthy to explore such matters in peacetime to the mutual advantage of both doers and operators. Moreover, I submit that an engagement simulation after-action-review is nothing more or less than a "quality circle" such as you might find in many modern factories.

And a concluding anecdote about doers. My division was provided a new electronic warfare organization, staffed by highly trained technicians and equipped with electronic gear quite new to the division. I was counseled that this unit would pose distinct problems of training and discipline simply because there was no apparent peacetime mission for it. I elected to assign it the task of surveying the division's tactical communications and devising ways of making them less vulnerable to the sort of threat the unit was designed to pose for enemy formations. That tasking produced many benefits, but to cite just one, a private devised a directional antenna for the FM radio which provided the backbone of the division's voice communications. We were able to fabricate large numbers of these highly effective antennae for about \$15 apiece within the division, rendering our command nets far less susceptible to jamming or intercept.

### SUMMARY

Moving from anecdote to prescription for operators and doers, I would opine that to adapt to high technology the military services need both field-deliverable education programs targeted expressly on skill inversion, and leadership techniques designed to involve servicemen and women who interface directly with high technology equipment in the exploitation of that equipment's potential in both peace and war. Thus far, I must report that we have had only mixed success in both respects. But my experience and my instincts tell me that the principal difficulties we have encountered reside in resistance and obtuseness among the planners, not with the reluctance or lack of capacity among the operators and doers. Obviously, communications technology can be put to the service of training operators and of providing for upward mobility of doers through on-the-job broadening. But communications technology can perform one other valuable service: it can establish feedback loops to the planners, affording new insights into the competence of operators, and new understanding of the level of skill and knowledge among the doers. As my colleagues on this panel will attest, I am sure, none of this will come easily to conservative institutions such as the Army, the Navy, the Air Force, and the Marine Corps. But surely as change has come to other sectors of American society, so too will it come to them.