

**Successful Technology
is
Timely and Applied Technology**

**by
James V. Boone**

I appreciate the opportunity to speak here today. This is an important conference and it is a privilege to be a part of it. Thank you for the invitation and the kind introduction, General Ferguson.

The theme of this conference is particularly attractive to us at TRW. We have always operated with a strategy that emphasized the importance of advanced technology. We know that we are not alone, but we make every effort to differentiate ourselves in the marketplace with advanced technology. We know it has been a key to our past success....we believe it will be a major part of our future. We are counting on it. I personally believe that the ability to apply advanced technology will be a major factor in the success of our future defense efforts. From what I have heard and seen so far at his conference, I believe that I am just one voice in the choir.

I, too, am going to talk mostly about management process. I like to tell people that the "real" innovative contribution of the Wright's is in the Air Force Museum just a few miles from here...the two page (double-spaced) contract they signed for the first aircraft delivery . That management innovation gives us something to shoot for!

I am sure that you do not need any additional encouragement to believe that the future is not going to be like the past. While predicting the future is hazardous at best, I believe that the basic military requirements of the future have already been stated very succinctly. I have two quotations to share with you. I think that they make the case.

The first is from General Loh. As a part of a presentation he made to the AFA Air Warfare Symposium in January of this year , he said...

" We need suitable instruments of power to influence and control events when we commit to action, and most importantly, we must win quickly, decisively, with overwhelming advantage, and with few casualties."

That is a tall order, but accurate. It has implications that cover the entire spectrum of military activities, modeling and simulation, reconnaissance, surveillance, weapons , delivery systems, command and control, communications, analysis, planning, logistics...you name it. Advanced technology is required to meet the demands in all of those areas. But there is another aspect.

The second quote is from Dr. Bill Perry, co-director of Stanford University's Center for International Security and Arms Control and former undersecretary of defense research and engineering. In a recent interview he said...

"If you are in a war, it is going to be a come-as-you-are war."

This thought, which I think is also generally accepted, injects all kinds of complex requirements into the process of being able to field the type of forces which Gen. Loh needs to accomplish the missions of the future. Not only is advanced technology required, it must be quickly, continuously, and routinely, integrated into fielded systems.

Some argue that these thoughts are not changes. Well, they look new to me. Some make official statements that seem to be in conflict with these two thoughts. A good example, one of my favorites, is a DoD Public Affairs statement...

" The DoD can afford to take more time in developing and evaluating new technologies before making decisions on weapons production."

Some of us doubt that it is even possible to take more time ... and I do not think that we have ever been able to "afford" that time. **What is needed is a much improved ability to apply the technology that results in the improved mission capability, and to do that regularly and routinely, in a sustainable, affordable way.** That is another tall order.

General Yates has accepted that order with enthusiasm. At the AFA National Convention last year he said,

"Our goal is to continue to exploit new technologies that will give our warfighting commands the weapon systems they need to fulfill the Air Force's global reach, global power vision."

OK, the objectives are identified and the challenge is accepted. That is very good. However, I think that is very important to recognize that we simply cannot meet that order today. The "we" is the combination of government (both legislative and executive branches) and industry. I believe that if we are to even have a chance at meeting our new requirements, we must make major changes in at least three areas. I will discuss each of these briefly. I do not claim that these are original ideas. In fact, I have discussed them in one form or another with a number of people and know that others also discuss them. I think it is useful to put them on the table here today.

- o The first thing that we must do is **come to a complete realization that successful technology...that is timely and applied technology...must be routinely insertable at system levels and be compatible with the manufacturing base.** Always. Otherwise the technology effort is not successful and has been, essentially, a waste of resources as viewed by the operator.

Our old ways of doing business, which are still largely the methods in use today, will not result in the required level of success. The work being done by General Yates's people on the "Integrated Weapon Systems Management " approach is clearly in the right direction. In particular, "inserting technology" is recognized as one of the seven emerging principals of this approach. It requires that technology planning teams create, and keep up to date, technology master plans that are program specific. In addition, the ongoing restructure of DDR&E which applies top-level focus to the more basic technology development activities in seven areas is clearly helpful. I hope everyone realizes that this is new...this is really different. These approaches imply:

An entirely new top-level planning process with new success criteria.

A requirement for continuous industry involvement in the total process

Completely revised roles for competition advocates, and

New roles for Government Labs and "not-for-profits".

Perhaps the topics of continuous industry involvement and competition advocacy need the most amplification. I believe that we must break the sterile process of requirements generation on the government side and the clinical examination of responses from the industry side. True, there is also some progress in this area and the F-22 program is viewed as a good example of some aspects of how we might proceed. However, as we move toward an acquisition process that is dominated by upgrades rather than new starts, it becomes increasingly important for all parties to engage in capability and affordability trades. The government buyer wants to avoid getting stuck with only vu-graphs and the industry member wants to be sure that there is a real prospect of successful technology insertion in some reasonably predictable time-frame. We are interdependent. We can recognize that and still take all of the precautions required of reasonable citizens to protect the integrity of the process. I want my money's worth as a taxpayer too! I do not get it with delayed starts, false starts, terminated programs, stretched programs and expensive multiple bidding processes.

As we move toward an upgrade-dominated acquisition process it seems likely that a System Program Director will become closely associated with a set of industry "centers of excellence" upon which the activity will depend for the very large majority of the upgrade activity. To do otherwise would seem to require

cost structures which would be self-defeating. Competition advocates must understand this situation. When this upgrade-dominated process becomes the normal way of doing things, the support required from the Test Centers, the Laboratories, and the (intentionally) not-for-profits, takes on a somewhat different character. While the Labs and others will supply technical know-how, judgment, and general review support as a part of the integrated product-team, just discussed by General Yates, the source of the successful technology will be industry. In this situation, large scale technology development "in-house" by the government seems to be at cross purposes to the basic strategy.

- o **The second thing that we must do is to insure that technology development is generally carried further than it is today.**

For example, we can have the greatest GaAs chip in the world, have patents, have given great papers and received awards, but have we really done all of the hard engineering things that assure qualification for mission-peculiar requirements, or have we taken producibility demands into account, or do we know how to determine cost as a realistic function of time? And most important, who pays for all of this work? The System Program Director? The Lab? Some other government agency like DARPA? How does one program share costs with another on these issues? One service with another?

Three areas of activity are suggested here.

a technology planning process which includes manufacturing and qualification stages

a revised budgetary process which accommodates the larger technology budgets which are required

a new methodology for cross-service coordination of standards and resources

We have real problems in this general area today and the satellite business is probably the best prepared for an upgrade dominated acquisition process. Back to my example, one of our newer systems is largely made possible by application of a large number of GaAs chips. The basic capability is supported by the DARPA MIMIC program (which, by the way, is a very successful technology program from our point of view). The process for producing and testing those chips was certified by the particular customer Program Office. They paid for it. They are satisfied. What of the other potential customers? How do we go about taking advantage of the existing production capability? Those are key questions that cannot be answered by industry alone. These particular questions are being addressed jointly today, but they must be quickly resolved in each and every case. Again, we need to be involved in the top level planning processes in order to be able to make good business decisions ourselves and also to aid the government in getting the best possible trade-off information.

We all know that it takes a lot of hard engineering to deliver a technology to a real user. We also know that we cannot afford to do all of that engineering work for every possible new technology. Taking longer to decide which is the "right" technology is not the right answer! If we are to gain operational advantage from a new technology we must do all of that engineering work that will get it into a fielded system. It seems to me that we must be able to place our technology bets earlier in the total scheme of things rather than later. Some of our satellite system customers have been very good at doing this. Together, we have successfully carried out technology upgrade programs that have been able to keep system capability at or near the requirements level for several decades. While this is nowhere near uniform, it can be done. I know that there are also good examples in other parts of the industry. It takes an unusual amount of discipline, continuity, commitment, and cooperation, but it can be done. The challenge is to make this the routine, normal way of doing business, not the exception.

- The third thing that we must do is more cultural than procedural. It may prove to be even the most difficult. **We must come to a shared understanding that realistic (increased) profit must be permitted on technology and development programs.**

Even with joint participation in advanced planning, with improved standards between buyers, with a better understanding of the factors of competition, and better defined roles for government laboratories and non-profits, we will not really succeed unless this point is understood. My organization has an interesting mix of basic technology work and systems work. Like a lot of other people, we have taken technology work at lower profit targets than we like for a long time. To the extent that we have been successful in efforts to insert that technology into new systems work, that has been a reasonable strategy for us. To be specific, the fees we earn on our systems work are more than twice those that we earn on our technology contracts. We think even that is better than average performance in the industry. It is clear that with reduced probability of systems work we cannot sustain our technology efforts in the long term without major changes.

Some of our technology customers imply the attitude, "well, you should be glad to do business with me at any fee percentage, because you have reduced access to systems work." That may be right... but only for a very short time. Modern technology work requires a cost structure that is rich in capital. That is true without regard to the eventual marketplace...either military or commercial. At least in TRW (and I have no reason to believe that it is much different elsewhere) when we add assets we like to feel that we are going to earn a reasonable return on them. Without better earning potential, I believe that the technology base of the defense industry is at real risk. Fortunately, there are ways to improve this situation. They include:

establishing new attitudes for contracting officers and
COTRs

permitting the existence of "centers of excellence" in industry with cost structures which support advanced development and the insertion of particular technologies

establishing new standards of budgeting and programming

I trust that it is clear that we are talking about **new partnerships**. I'm going to quote General Yates again. At the Air Force Acquisition conference, he called for partnerships. He said,

"As partners work in tandem they come to understand the motivations, capabilities and sincerity of each other. In short, partnership will lead to greater efficiencies in our business."

We totally subscribe to that thought. It will take improved partnerships to make the changes that are required. Perhaps one day in the not too distant future we will have reached a level of partnership where we no longer use our acquisition equivalent of the Miranda Act warning..." It is understood that this letter is not intended to be a commitment by the Government which could form the basis of a claim for compensation."

If we are going to get the benefits of advanced technology, and we really do need them, we must make changes in our processes. We can do it!

I am reminded of my favorite Gary Larson cartoon. It takes place in a setting very much like this one. An auditorium with an audience and a speaker. In his cartoon, the characters are all dinosaurs. The speaking dinosaur says,

"The climate is changing. The mammals are taking over....and we all have brains the size of a walnut!"

I guess they did not actually do very much about their situation. Our situation is much better. Of course, there are still problems with the climate. However, we are the mammals and we know what we must do and how to do it. If we get on with it, we will provide applied advanced technology in a timely fashion. In other words, successful technology. That should be our future. If not, we run the very real risk of winding up in a very short time tending the equivalent of a dinosaur farm rather than providing our forces with the systems that they need.

I think the choice is entirely up to the partners. Us.

Thank you.
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