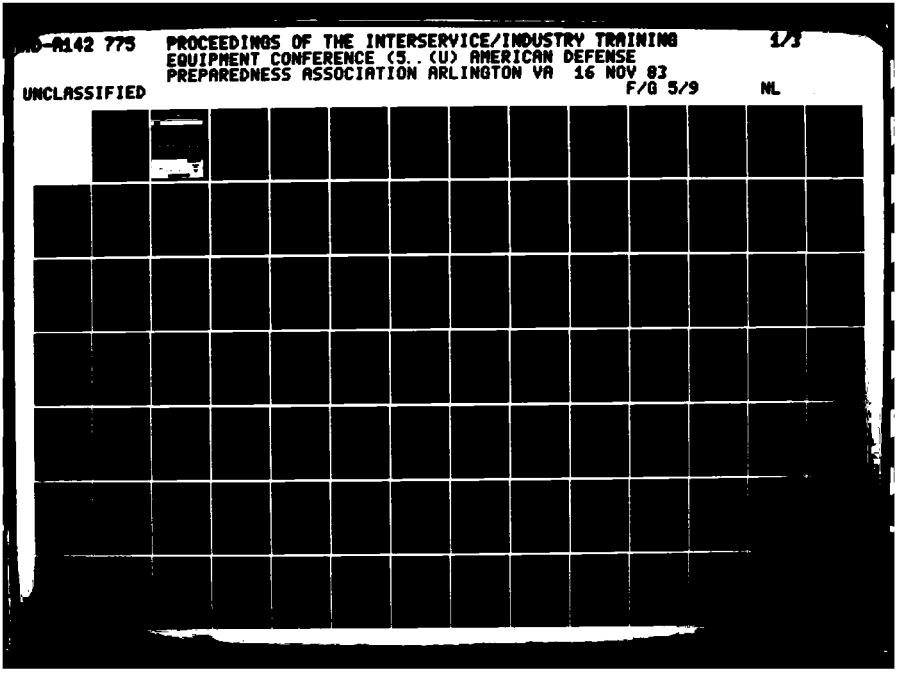
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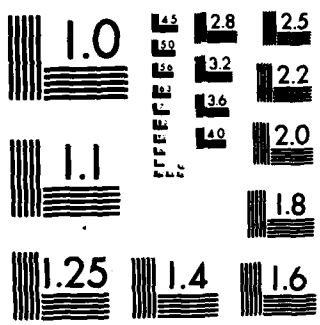

VOLUME II

PROCEEDINGS

November 14 - 16, 1983

5th

INTERSERVICE/INDUSTRY TRAINING EQUIPMENT CONFERENCE

FIFTH INTERSERVICE/INDUSTRY TRAINING EQUIPMENT CONFERENCE

Sponsored By:

American Defense Preparedness Association

Washington Hilton Hotel
Washington, DC

November 14-16, 1983

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OPENING REMARKS

NOVEMBER 14, 1983

Mr. John A. Todd

Distinguished guests, ladies and gentlemen, good morning. I'm John Todd, your conference chairman, and it's my pleasure and privilege to welcome you to the Fifth Interservice/Industry Training Equipment Conference. Today is the culmination of over a year of planning by your conference committee. For the next three days, you will hear a variety of papers, presentations representing technical, management, and user views on training and training equipment. Several outstanding panel discussions will give you an opportunity to hear a wide variety of views ranging from the Defense Department to Congress to industry regarding their viewpoints on training and training equipment. Also, you are invited to visit our exhibit hall, where over 70 companies are exhibiting the latest in training and training technologies.

The theme of this ~~year's~~ conference is increased readiness through training. Certainly, meeting this challenge becomes more difficult year by year as our weapon systems become more capable and also more complex. Multi-million dollar weapon systems demand the ultimate in training to ensure that crews are ready to operate them at their maximum effectiveness. Otherwise, we may have wasted valuable dollars buying increased capability that, for the lack of training, we cannot use effectively. This, then, is our readiness through training challenge.

The purpose of these conferences is to promote the interchange of information between government and industry. It is only when industry thoroughly understands the government need and government thoroughly understands industry's capability that we can work together and function effectively as a team. We invite this candid exchange of information and views during the conference, and encourage each of you to participate.

I hope that your stay in Washington is pleasant and you find the conference productive.

Now I would like to introduce General Henry A. Miley, President of the American Defense Preparedness Association. For many, many years General Miley has been recognized as an innovative leader in solving and working towards a solution of material management problems affecting industry and the Department of Defense. General Miley.

General Henry A. Miley

Good morning, ladies and gentlemen. It seemed to me as I made my way up, as I do each morning, from Solomon's Island, Maryland, to the hotel here (which is 72 miles by my speedometer), I felt in a very good mood because, number one, the weather was good and because of the events of the Meadowlands and San Diego yesterday. A new dimension for the Washington Redskins!

Unless your distance vision is defective, most of the things I would say in a welcoming two or three minutes is up here on the screen, so I won't elaborate, except to note that this is the fifth of the ITEC conference. I've been to all of them and each one has been larger than its predecessor, larger in two dimensions. One, larger in the number of people who attended the conference, and two, larger in the number of exhibitors who wanted space to show their wares to the prospective market. As the Chairman has indicated -- and you'll hear this elaborated on in great detail and from many aspects -- as the weapons systems that we use on the battlefield and in the air and under the sea have become more expensive, the Services have found it in their hearts and pocketbooks to spend more money on the training equipment to make sure that they can operate and maintain the equipment effectively and cost effectively. The other dimension is that this additional emphasis on training and the additional money on training equipment has opened up an opportunity for high tech smaller companies who are not the giants of aerospace to get into the Defense business and over the five years that I've been participating in these conferences, I've been pleased to see the presence, and you will see today the presence of the smaller high tech company in this business.

So without further ado, let me welcome you to the fifth ITEC conference and encourage you to take full advantage of the confererence, again in its two dimensions: number one, in the technical sessions that the conference will include and to spend as much time as you can downstairs in the exhibit area.

Have a good conference.

Mr. Todd

Ladies and gentlemen, as I am sure most of you are aware, the sponsorship on the Service side for these conferences rotates among the Services year by year. This year the United States Air Force is the lead service and it is my pleasure at this time to introduce Colonel Gerry Blake, who is the Deputy for Simulators, Aeronautical Systems Division, United States Air Force. In a true interservice sense, Colonel Blake graduated from the Naval Academy and then was commissioned Air Force. So he has at least two legs on the three or four. Colonel Blake is a command pilot with over 5,800 hours of flying time. He is a graduate of the

United States Air Force Test Pilots School and has been in his present position since December of last year. Colonel Blake.

Colonel Gerald A. Blake

What John doesn't know is that I'm proud to say that my father is a West Pointer, Class of 1931; my brother went to the Air Force Academy, Class of 1959; and a young man who I consider to be my third son just entered the Marine Corps from the United States Naval Academy and is serving at Quantico.

Good morning, ladies and gentlemen. I can't tell you how pleased I am to be representing the Air Force at this year's conference. I've been privileged to observe first hand over my Service career the contribution that training makes to operational readiness. As a pilot training instructor for 5-1/2 years, I knew that we were training our pilots for the rigors of a military career and that that training would have to sustain them through countless dangers. The thought of that tremendous responsibility always kept the value of quality training uppermost in my mind. While serving in Southeast Asia with my brother, he was the first Air Force Academy graduate to down a MIG over North Vietnam. I asked him what he remembered most about the mission, and the first thing he said was he was given superb equipment to fight with. The second thing he remembers was how well his training had prepared him for that lightning fast life-or-death moment. Every move he made was an instinctive reaction based upon years of training and it literally saved my brother's life.

For the past 12 years I've been involved in system program management at various levels, so I've come full circle back to the place where it all begins. In the process, I've become even more aware of the key role that training plays, effective training, in performance. Every successful team, be it a military outfit, a civilian business, or an athletic team, is marked by the teamwork it displays. Indiana's Bobby Knight, one of the finest coaches in college basketball, once remarked, "Many people have the will to win; few people have the will to train to win." It's that syndrome that we collectively have to fight. It's infinitely more satisfying to play a real game than it is to run up and down the court for hours in practice, but you can't win real games, especially the tough ones, without it. When the U.S. Armed Forces play for real, it's the toughest contest of all.

So we all know that we have to train to win, but it's hard work and besides that, it's not much fun. Pilots leave black heel marks going down to the simulator. I know -- I was one of them. Flying an airplane is a lot more fun and it is a great training device. Maintenance troops would rather be up to their elbows in grease working on a real device than they would be working with an aircraft maintenance trainer. My wife laughs at how I don't

read car repair instructions until I've got everything strewn all over the floor of the garage and I get stumped and can't figure out how it all goes back together. One reason is I want to fix my car; I don't want to read about fixing my car. So I know I'd be more efficient if I were to study the procedures ahead of time and do that, but I rationalize that I'm actually more efficient because the time I save by just pressing on more than offsets the time I lose by having to read the procedures. So rationalization is interesting. In a recent movie, several old friends were having a philosophical discussion about the power of the mind to put things in perspective. One individual remarked that rationalization is more important than sex. When his friends challenged him as to why he thought that was true, he replied, "Have you ever gone a week without a rationalization?"

Crew members and maintainers don't have to rationalize practicing with the real thing, but we can't afford that. They are sometimes not as enthusiastic about their training equipment, mainly because they don't sincerely believe that that training equipment is increasing their skill level. And I think that's our challenge -- to convince the individual being trained that he or she will be better at their job for the training received.

We're responding to that challenge and I would not for a moment belittle the considerable practice that's been made, but we have a long way to go before training and training equipment assume their rightful position in the operational readiness equation.

We're honored this morning by the presence of a keynote speaker who has demonstrated beyond a shadow of a doubt his commitment to operational readiness. Under General Marsh's leadership, Air Force Systems Command has established as its goal delivering supported weapons systems as opposed to supportable weapons systems. For the first time, acquisition and logistics has been recognized as an integral part of the weapon system acquisition process. General Marsh and General Mullins, the Commander of Air Force Logistics Command, recently presided over the creation of the Air Force Acquisition Logistics Center, which was previously the Air Force Acquisition Logistics Division, at Wright-Patterson Air Force Base. To some, this may appear to be nothing more than a minor name change, but when those of us in the business look at that organizational sign and see AFSC and AFLC in the lower corner, we know that General Marsh has achieved something truly significant -- the active inclusion of logistics considerations in the acquisition process.

In getting to his present position, General Marsh's accomplishments are equally remarkable. Following two years in the Army Air Force as an aircraft mechanic and an aerial gunner, he was selected for Regular Army appointment to the U.S. Military Academy at West Point in 1945. Following his graduation in 1949, he attended the

Air Tactical School at . . . Air Force Base, Florida, and the Atomic Weapons and Radiological Safety School at Keesler Air Force Base, Mississippi. Following two weapons-related assignments, General Marsh transferred in 1952 to the Seventh Air Division, Strategic Air Command, where he served in a job that appears to be a significant indicator of things to come, that of an armament and electronics staff officer. Following two years there, General Marsh got his Masters of Science degrees in instrumentation engineering and aeronautical engineering from the University of Michigan in June of 1956, and subsequently served his first R&D tour at Wright-Patterson Air Force Base as a Project Officer in the Navaho and Matador . . . Program Offices. From September of 1959 to June of 1965, General Marsh further expanded his skills and experience with a tour at the Ballistic Missile Division as a Space Systems Project Officer, in between Command and Staff and Air War College tours as a student.

It's at this point in 1965 that we see things really coming together for General Marsh and his assignments. He went to Headquarters, USAF, as a Staff Officer in the Directorate of Reconnaisance and Electronic Warfare, then Chief of the Directorate of Space Projects Division, and then finally, the Executive Officer to the Deputy Chief of Staff, Research and Development. In 1969, he became the Deputy for Reconnaisance, Strike, and Electronic Warfare at Wright-Patterson Air Force Base, where I was privileged to come in contact with him on occasion when I was a pilot with the 4950th Test Wing. After attaining the rank of Brigadier General, he was assigned to Headquarters, Systems Command as the Deputy Chief of Staff for Development Plans, which helps to explain his deep commitment to the excellence of development planning within Air Force Systems Command.

From there, it was strictly upward mobility for General Marsh as he progressed through assignments as the Deputy Chief of Staff for Systems in October 1973, the Vice Commander of Systems Command in August of 1975, Commander of the Electronic Systems Division in May of 1977, and Commander, Air Force Systems Command in 1981. During this time, General Marsh was responsible for several significant events in the training equipment area. He helped create the simulator master plan, forged the agreement for fighter visuals, created the Simulator Division within Air Force Systems Command Directorate of Operational Support Systems, and served as the Air Force Representative at the outbrief for the Defense Science Board Study on Training and Training Technology.

Ladies and gentlemen, please join me in welcoming our keynote speaker for this fifth conference, General Marsh.

General Robert T. Marsh

Thank you, Gerry. Well, General Miley and Mr. Todd, ladies and gentlemen, good morning. I want you to know that I am really

pleased to join you today to help kick off this important conference and this is an important conference, dealing with an important subject -- training and the equipment needed to accomplish it.

To underscore the importance of this conference, let me simply remind you that the statutory responsibility of the Air Force and of the other Services is to recruit, train, and equip the forces necessary to carry out our combat operations. Today, you are gathered here to pursue methods of improving the way we train and providing the equipment we use to train. So you have an impact on two of the Services' fundamental responsibilities.

I don't think you can overstate the importance of effective training today. It has a direct relationship to readiness in combat capability and the success of our deterrent posture. Let me explain that. The United States has for some time now relied upon its superior military capabilities to offset the numerical advantages enjoyed by our adversaries. And that the deterrence has worked is ample evidence of the wisdom of this strategy. The effective training of military men and women is a prime ingredient in maintaining the superior military capabilities that make deterrence work. In fact, General Gabriel, the Air Force Chief of Staff, describes the elements of superior military capabilities as the three Ts -- superior technology, superior tactics, and superior training. The theme of your conference this year is increased readiness through training. It's an appropriate theme. The readiness posture of our armed forces is to a large degree dependent upon the success of our training effort. By its very definition, readiness means being prepared to accomplish the mission and that's a pretty good definition of training, as well.

You, the men and women of the Defense and industry training equipment community, play a major role in the development of the superior training that is essential to our Defense posture. I am here today because you are responsible for a significant contribution to the Defense capabilities that have kept America free in the past and will ensure the security of future generations of Americans.

With that thought in mind, I want to give you some of my ideas about the development and acquisition of training equipment. In recent years, the Air Force's Research, Development, and Acquisition community has become increasingly sensitive to the central role of man in the weapon system. There's a very good reason for that. In many respects, the human being has become the limiting factor in our development of even more capable weapon systems.

Let me give you give example. The F-16 Fighting Falcon is one of the two best fighter aircraft in the world today. That airplane can spend the whole day engaged in stressful combat

maneuvers that subject it to more than nine times the force of gravity. Man cannot. To enhance the combat capability of this system, man and machine, we've developed a training program to increase the pilot's ability to tolerate high G forces. In this case, it's a physical training program involving everything from diet to weight lifting and centrifuge training. But we had to do it. Man is the key element in this system and without the right training, his use of the system is constrained.

The connection to the theme of this conference is pretty obvious. We are training pilots to handle G forces better and thereby increasing their capability and you are here for a training equipment conference. But that's only half the point. The other half is that man has become more critical in our hardware decisions. The role of man as a key element within weapon systems has broken through the hardware bias that has plagued weapon system R&D for years. And this is an absolutely vital point for you to understand because I believe that man is the central element in the development of training equipment, too. And I'm not convinced that our efforts to develop training systems and design training equipment actually recognize this fact.

If anything, man is more critical to the development of training systems and equipment than he is in weapon system R&D. For while man is most widely recognized as an essential element of the weapon system which drives us toward increased man-centered engineering, the final product in weapon system R&D is still hardware.

In your business, the final product is not hardware. Your final product is a fully trained man or woman. Training is unique for that reason and it must be treated as unique.

Let me walk you through the steps of the acquisition process and tell you how I believe we must adjust our attitudes toward training equipment in order to fulfill our mission.

The first step in the acquisition of any system, as you know, is requirements definition. My view of the requirement setting process within the training equipment R&D community is that we're still totally dependent on the lessons learned in hardware R&D. We use the same terminology, the same measures of merit, and apply standards as though we were buying a tank, ship, or an airplane. We still tend to define a training system in terms of its hardware and emphasize specifications like desired mean time between failure rates for the equipment, demonstrable equipment performance parameters, things like field of view, spares requirements, fidelity of the simulator displays to the real world, and so on.

While these are all needed, I maintain that they are not part of the requirements statement necessary to the design, development, and production of an effective training system. Rather, I suggest, that we must consider hardware as a single element of

the training system which centers about the trainee and instructor and incorporates equipment, texts, facilities, evaluations, and so forth. We should, then, be considering ways to express our requirements in terms of the system's central element, which is the actual product that the combat commander wants to acquire -- a trained soldier, airman, marine, or seaman. The requirements statement should be a statement of skills needed, the behavior patterns that must be learned, and the degree of learning required. The determination of which hardware to use in what configurations and so forth are questions for consideration during development, not during requirements definition.

Perhaps we can take a lesson from professional football and baseball coaches. When NFL coaches see the need to enhance a running back's skills, they express a requirement for the specific skills and then they propose training programs to provide those skills. For example, they may state the skill required as agility and then identify a method of achieving it, but they don't run straight out and build an obstacle course of old rubber tires for the player to run through. They don't go right to the hardware. They look at alternatives. Hence, ballet teachers giving classes to football players, or the aerobic dance instructors leading spring practice training drills in a pro-baseball camp to enhance the team's stamina. We must do the same. Not reject hardware as a solution to the requirements statement, but put it into a proper perspective as a decision farther down the line.

In the requirements definition stage, the bottom line is that we must know what skills are required and specify system performance in training effectiveness terms, which requires a focus on the real product -- a trained person.

The next step is, of course, development. This is the proper place to consider the hardware necessary to the training system. I want to inject a note of caution here. Currently, I believe our development efforts in training systems have concentrated too much on achieving remarkable fidelity between training device and real world without anyone questioning whether the degree of realism and its associated costs have actual value in the development of skills. Let me give you an example. For years, we kept putting real aircraft instruments into our trainers and simulators, making sure that the student got used to the real thing. Since instruments in simulators get about six times as many cycles as those in the aircraft themselves, our MTBF rates were low and we found ourselves with rather large maintenance bills on the simulators. Finally, somebody noted that the only thing that the student really needed to see was the dial face. The student couldn't care less whether the guts of the real instrument was behind the aircraft panel. As long as the equipment used trains to the desired level of performance, then we shouldn't be concerned about total fidelity.

We need also, during development, to start asking some central people-oriented questions. Things like what's the optimum lay-out of the instructor's station; what's the best trainee and instructor relationship, and so forth, including the tough question of determining the best mix of instructor, video tapes, simulators, text books, and on and on.

I know that sounds rather simple, but I think a review of our past performance will show that it is rather hard to resist that additional little bit of realism that gives our training equipment the real "gee whiz" flavor. I think it is made especially difficult by the way we conduct tests and evaluation of training systems. All to often, our tests and evaluation efforts are based on the experience we gained in weapon system acquisition. We look for quantification. Well, that's most easily accomplished by measuring the performance of the hardware -- what's its reliability, what's its capability. Instead, we should be measuring the speed and degree of skills acquisition by the trainee against our stated requirements. Further, our penchant for high fidelity in anything that purports to simulate the task to be performed in the real world creates a propensity for an evaluation process that involves bringing an operator into the facility, sitting the operator in front of the training device, demonstrating the device, and then asking is it like this in the real world. The answer sought is, of course, yes. But that question is totally irrelevant if high fidelity is not essential for skills acquisition.

There's another drawback to testing for fidelity. It will always be subjective, since it relies on human perceptions of the similarities in two different situations. The major problem here is that the tester's perceptions, colored as they must be by prior familiarity with the environment that is being replicated, do not necessarily correspond to the perceptions of neophytes. Additionally, since testing for fidelity is often performed by people with high levels of experience, we may miss opportunities to enhance the learning curve. There are anomalies in real world situations that are taken for granted by those who are experienced in those situations. These same anomalies may present a significant problem for someone who is new to the situation -- a problem that could be eased if the anomaly were identified and then overemphasized in the training device.

Reducing emphasis on the subjective test and evaluation required for fidelity and increasing emphasis on testing the training output, the trained people, is the solution. Test and evaluation must answer questions about whether systems actually provide the range, breadth, and depth of knowledge and experience using the right and most affordable media necessary for the student to master the required task sufficiently to accomplish the mission in the real world. If it does, we've developed a good system. If it does not,

then we haven't developed a good system. The focus must be on the training, not on the device. The deliverable may be hardware, but the product is trained people and we've got to remember that.

From this human-centered perspective, there are a variety of implications for the Services and for industry about how we conduct our business of designing, developing, and building training systems. Implications for everything from basic research to placing the system into operation. Our technical base resources -- government, industry, university labs, IR&D programs and other development efforts -- have to begin focusing on really important issues if they're going to pave the way toward a new and more useful approach to training equipment development. Among the basic questions that still need answers are:

- How do people learn in various situations?
- How should instructor station design be accomplished?
- Are there common instructor tasks that can be incorporated into common design specifications for more than one system?
- Which cues provide the most effective training, i.e., visual, audio, motion, tactile, and what are the proper mixes for learning various skills?
- What are effective levels of fidelity for specific situations?
- What kinds of measurements can be applied to quantify training effectiveness?
- What are the trade-off criteria for the various training media available -- simulator versus text books, actual hands-on versus simulators, etc.?
- What are the best or more effective uses of embedded training devices?

In all cases, the research undertaken must be designed with the man-centered nature of training in the forefront. To do otherwise would perpetuate an emphasis on hardware that we may not be able to afford.

In treating the training system as a whole, we have to find what the real components in subsystems are, in addition to the central human elements -- students and instructors. There are texts, facilities, audio-visual aids, part-task trainers, databases and scenarios, mission simulators, support equipment, spares, and so on. In changing the way we do business, there are a number of adjustments to be made. The first involves insisting that the

development process reflect the kinds of requirements definition, development, and test activities that I outlined. But that's not enough. We will also need to take a hard look at our acquisition team and perhaps redefine its membership. Typically, a program team has a chief engineer, a chief software person, a lead mechanical person, and so on. Missing are training specialists -- people with the education, perspective, and professional tools necessary to ensure a proper emphasis on the end product -- a trained individual. People who can evaluate, empirically, the training potential of the entire system and each individual resource. Finally, the training specialist will be the advocate of the "can it train" criteria, balancing the other legitimate program concerns about hardware.

The bottom line in training systems and training equipment is how quickly and accurately can one or the other training system or piece of equipment produce a trained person, and at what cost. Those are the criteria that determine the affordability and usefulness of particular training systems.

Well, this morning I've been describing my view of the challenge facing us, members of the Defense training equipment community. I recognize that these ideas are not new to most of you; rather, a collection of some of the criticism, innovative thinking, and new ideas that have been circulating throughout the professional comunity for some time. And I know that some of the research work I've mentioned as being possible for the future is already underway at your labs. I commend all of those efforts. They are steps toward improving your efficiency and effectiveness of our training systems throughout DOD. More importantly, they are steps in the direction of increased national security in the future.

Ladies and gentlemen, I ask that as you enter this conference you test these ideas in the technical, management, and other seminars that you will be attending in the next couple of days, and work together to improve training equipment development and acquisition. We in the military and you in industry are truly members of the joint effort on the training equipment front. It's up to us to ensure that we provide all the Services with the end products they require -- properly trained, prepared, and highly capable soldiers, marines, airmen, and sailors.

Thank you very much. Have a good conference.

Colonel Blake

Thank you, General Marsh, for your comprehensive and penetrating insight into what I'm sure are many of the problems that we'll be discussing in more detail during the next three days of this conference.

PANEL DISCUSSION

DEFENSE SCIENCE BOARD 1982 SUMMER STUDY ON
TRAINING AND TRAINING TECHNOLOGY

Mr. John A. Todd

Our discussion today is on the results of the Defense Science Board Summer Study, completed in 1982, and the subject was training and training technology.

We have a distinguished panel this morning. I will not introduce each panelist; I think most of them are familiar to you and your moderator will have a remark about his panel.

Most of you have read, I'm sure, a biography of our distinguished moderator and it goes without saying that both in industry and government he has been a leader in innovative solutions to our material management problems. One personal note to show you the devotion above and beyond the call of duty that this man has to the cause, he flew this morning until approximately 4:00 a.m. to get here in Washington to be with us for this panel meeting and is ready now to give you the benefit of this panel's thoughts. It is my pleasure, from a personal standpoint as a personal friend, to introduce the Honorable Norman R. Augustine.

Honorable Norman R. Augustine

John, thank you very much. We do have a panel of distinguished speakers this morning. Let me first of all acquaint you with what the planned format is. On your left we have representatives of the various Service Secretariats, three of our key Assistant Secretaries. They're going to speak with you briefly, sharing with you a few of their prepared thoughts on the subject of training and training equipment. Then, on your right we have our reinforcements, of course, who are senior representatives from the field commands with responsibility for training in each of the four military Services. We won't ask them to make specific speeches at the outset; we will ask them to take your questions.

That brings us to the most important part of the meeting and that is that the success this morning is going to depend as much on you as on those at the table here. We need questions. We like lots of good questions, very tough questions. So this is your chance to ask all of the things you've always wanted to know. It's also a good time to offer any answers. We always welcome those, too, if you have any of them.

The question always comes up, if training is so good, why is it so neglected? It always seemed to me to be one of the great enigmas - neglected particularly in the budget sense. I think one reason, probably, is it is difficult to measure the fruits of training, at least in peacetime. But maybe more importantly is that training is so very perishable. It's perishable in the context that people move from job to job in the Services; it's perishable in the sense that people move into the Services and back out into civilian life; and then, of course, perishable in the sense that all human beings have a retention span which is less than an entire career. So you tend to invest and it tends to disappear with time. I used to think in the budget process, when putting together budgets, that the tough part about training budgets is to decide when do you think you're going to go to war. For example, if you knew for sure it was going to be ten years before you went to war, I think you would spend all of this year's budget on R&D -- every nickel of it. If you knew it was going to be about five years when you went to war, you'd probably spend all your money on procurement. If you knew you were going to war within a year, you would probably spend virtually every nickel on training. So you come down to these very difficult, intangible questions and I think those are the kinds of things that are implicit in how we allocate our budget, particularly to training.

A year ago last summer, the summer of 1982, Secretary Weinberger asked the Defense Science Board to look at the subject of training, how we support it, how we conduct it; a panel was put together that was headed by Admiral Ike Kidd, who many of you know, and was co-chaired by the Honorable Walt LaBerge, who I am sure many of you also know. They assembled a group of distinguished individuals, qualified in the field of training and training equipment. They met at the Air Force Academy for a period of two weeks, as well as spending considerable time before that. The outcome was a report by the Defense Science Board on training and training equipment which included some 56 observations and some 17 discrete recommendations. These were made to the Secretary of Defense, who asked that each be implemented. They included such observations or recommendations relating to observations that the reserve components place very unique demands for training in terms of both limitations on time and limitations on space for training, and that they deserve special attention in terms of providing training equipment. It was pointed out that training can be a great incentivizer, a great motivator for troops. It was pointed out that new technology -- computers in particular -- can have an important role in helping in training. But it was also pointed out that you can design those things such that they teach bad habits, they teach incorrectly, they teach people how to beat the training device rather than to do what really is required in combat, and as such, if not carefully assembled, they can be counterproductive. It was pointed out there was a lack, in many respects, particularly in the budgetary sense, of a clear proponency for training in the military departments. It was suggested that an advocate for training be designated in each Service. The presence of this panel here this morning

suggests that indeed we have such an advocate today. It was suggested that more R&D should be devoted to training and training equipment. It was pointed out that an OSD steering committee on training, under the aegis of the Chairman of the JCS, should be established, that we need to upgrade our training ranges and in particular, to provide intelligent adversaries to participate in training. Finally, there's one from this sampling that I've picked and as one might expect, it was said that we need to increase the funding for training. Some suggestions were made by how much and by where that money might come from, and in particular where it should not come from.

Those were some of the things that came out of the DSB Summer Study that this morning is to be the glue that holds this panel discussion together. On the other hand, we've asked the panelists to say what's on their minds and not be limited to that particular study, and to range as far afield as they feel would be helpful to all of us in understanding their messages.

I'm going to introduce each panelist very briefly so we'll have as much time as possible for them to make their presentations. I'll introduce them just before they talk. Let me begin, in protocol order, with Army, Navy, Air Force with the members of the Secretariats. The first, of course, is the Honorable Jay Sculley. Jay is the Assistant Secretary of the Army for Research, Development, and Acquisition. He's a graduate of VMI, a former Army officer himself. He holds a Ph.D. from Johns Hopkins University. Prior to his current appointment as Assistant Secretary of the Army, Dr. Sculley was head of the Engineering Department at VMI. Please help me welcome Dr. Jay Sculley to the podium this morning.

Honorable Jay R. Sculley

Thank you for that warm welcome, Norm, and to General Miley and to John Todd and ADPA, thank you for this fifth interservice gathering on a very important subject. I also thank the Defense Science Board for providing, I think, a very necessary focus to a high pay-off area.

Distinguished fellow panel members and ladies and gentlemen, I enjoy being here this morning to spend just a few minutes on, as I said, a very important subject to me. I'm proud to be here. I represent the hardware community in the Army Secretariat, unlike my contemporaries that are really people-oriented. We want to put the soldier, in the form of the people representative, back into Army systems development and I think we are doing that.

Recent military operations have demonstrated the importance of well-trained, combat-ready forces available in emergencies. Army rangers and paratroopers, along with their comrades in our sister Services, have demonstrated the mental and physical toughness always necessary for success in battle. They have been well

prepared by the more-sweat-in-training, less-blood-in-battle school, but they have also benefited from a new training effectiveness multiplier called modern technology.

I don't have time today on the program to describe all of our initiatives, but as an example, technology has made possible a new type of drill which has made possible a very exciting form of training called engagement simulation. In its most advanced form, engagement simulation employs MILES devices -- the multiple integrated laser engagement system. It comprises a family of eye-safe lasers designed to simulate direct fire weapons of various types. Instead of firing a projectile, the weapon shoots a blank, acoustically activating the laser which sends a pulse of energy downrange. Each pulse is coded for type weapon. Detectors, mounted on personnel and vehicles, can discriminate incoming signals as lethal or non-lethal, determine whether there was a hit or a near miss, and signal the target accordingly. Used by all participants in a tactical exercise, MILES permits two-sided battle in which the interactions among direct fire weapons -- rifles, machine guns, tank and anti-tank weapons -- can be experienced with realism. With MILES, I believe the Army has at last fielded a way to train both for weapon proficiency and for tactical finesse.

Pivotal to the training is an after-action review in which the lessons from each casualty inflicted during the battle are reviewed with each party to the casualty before the assembled unit and tactics germane to the overall outcome are criticized. Repetitive battles, using MILES, reinforce the lessons of these experiences and facilitate rapid individual and collective learning. MILES and a host of other training devices in advanced learning aids are available or on the way to the field. The Army, I feel, is on the threshold of a new era in training.

The Defense Science Board, as Norm mentioned, in 1982, in the study on training and training technology, urged decisive and immediate action to ensure that our operational readiness be enhanced by the best training possible. I'm here today to state that the Army has been and remains committed to the improvement of training through the application of technology. We certainly appreciate the impetus for increased technological advances provided by the Defense Science Board.

Regarding the specific DSB recommendations, I agree that we must increase funding for training research and development. Indeed, the Army's planned training technology R&D funding request for fiscal year 1985 calls for a significant increase. That increase, however, appears to be more significant than it really is because of the painful cuts we took during the fiscal year 1984 authorization process. I hope this conference, particularly because of its being held in Washington, D.C., will highlight the problems we have had in getting decision-makers to provide the needed resources.

In order to maximize the combat potential for the total Army, we must accelerate efforts to apply technology to training our National Guard and our Army Reserve units. One indication of our determination to do so is the budget request for MILES for the fielding at 30 reserve component training sites during FY 84 and 85. This combat training method, having demonstrated its value during the few years since its introduction into the active force, I feel will significantly improve reserve components' training opportunities.

On range modernization, range modernization is being pushed on three fronts. First, we are building new ranges that exercise the full capabilities of our new Abrams and Bradley fighting vehicles. Second, we are upgrading existing ranges, rendered obsolete by 20 years of low funding priorities. Third, we are enhancing our standard range designs to permit realistic, challenging, combined armed training.

I've been sent here by the Secretary of the Army to be a strong advocate for training and training technology and you'll hear personally from him tomorrow. We believe that there is nothing more important than the continued utilization of training technology to promote the Army of excellence and to achieve increasing combat readiness in the decade of the eighties and into the nineties. I've looked forward to this conference as providing a dynamic forum for exchanging information and ideas to further our mutual goals and interests, and Norm, I appreciate the opportunity to be here this morning and participate in this panel. Thank you.

Mr. Augustine

Jay, thank you very much.

We will now turn to the Navy. Our representative from the Navy Secretariat is the Honorable Chapman Cox, who is the Assistant Secretary of the Navy for Manpower and Reserve Affairs. Chapman is a graduate of the University of Southern California, earned his Juris Doctorate from Harvard Law School, and he has practiced law in Los Angeles and in my home town of Denver, Colorado. He served on the bi-partisan delegation to Syria and Jordan during the Camp David Peace Accord, and prior to taking on his present position, he was a Deputy Assistant Secretary of the Navy for Logistics. He took on his role as Assistant Secretary for Manpower and Reserve Affairs in May of this year. Please help me welcome Chapman to the podium.

Honorable Chapman B. Cox

Good morning, ladies and gentlemen. Norm forgot one thing, which is probably just as important as all the rest and that is I'm a Marine officer.

I'd like to thank ADPA for arranging this conference. As Jay said, we in the Administration all believe that training is one of those areas where technology can be a very high pay-off area in terms of the cost benefit of the dollars we spend, and your efforts in getting us together and providing a forum where we can share ideas is very important. I thank you for that, and I also thank you for inviting me.

I am honored to represent the Secretary of the Navy here this morning on this distinguished panel, and I'd like to just share with you some of the highlights of actions which we're taking in Navy and the Marine Corps to improve our training efficiency and effectiveness, and hence, force readiness.

As you know, the recommendations of last year's Defense Science Board Summer Study emphasize the utilization of technology to improve training. Navy is actively supporting this goal and we are deeply involved in several such efforts. For example, the Navy Personnel Research and Development Center in San Diego currently has 34 ongoing research projects that address specific DSB recommendations and at the same time, the Navy Training and Education Center in Orlando is working on another 21 such projects. In fact, the only three DSB recommendations that are not being currently addressed by the Navy Department are those requiring actions by higher authority, and these are all presently being pursued in the Office of the Secretary of Defense.

Our commitment to training improvement goes much deeper than simply answering the mail of the DSB. Currently, under the direction of the Chief of Naval Operations, the Navy is making a cradle-to-grave assessment of individual training to evaluate our effectiveness in developing a master chief. We intend to do a complete review of the entire training continuum within each warfare area from recruit training and OJT through the various lev ls of formal schoolhouse training and professional education. At semi-annual education evaluation boards, Admiral Watkins and his staff evaluate training effectiveness based upon input from the Fleet commanders and the Chief of Naval Education and Training. This approach will not only provide increased visibility to the training process, but will also provide us with additional clues for improving training productivity and efficiency, as well as effectiveness.

Let me give you three examples of technology demonstrations which the Navy Training Improvement Program has identified. First, computerized maneuvering board training. This will allow ship handling skills to be practiced by more personnel at more locations, more often and at less cost. Second, a personal electronic aid for maintenance. This will allow lower-aptitude personnel to perform maintenance on sophisticated NATO Sea Sparrow missiles.

Third, an aid for authoring instructional manuals. This will reduce both the time needed to prepare lessons and the number of technically skilled Petty Officers required as instructors.

We have high hopes that each of these technology improvements, as well as others, will yield positive results for our future training efforts.

The Marine Corps, for its part, is currently fielding advancements to its system for simulation and evaluation of tactical warfare. This will provide greatly increased capabilities for staff training, evaluation of operational plans, and synthesis of command post exercises with actual field training. The Marine Corps is also developing an entire family of tactical decision-making training aids designed to train all levels of commanders, from the squad leaders to the Marine amphibious force commander. These training aids will range from simple board games to the most sophisticated computer simulation. In conjunction with the Army's extensive efforts in this area, which Jay referred to, the Marines will continue to evaluate the use of engagement simulators, such as the multiple integrated laser engagement system, MILES, to reduce the cost of training ammunition expenditures while greatly increasing the realism of combined armed training exercises. The recent excellent performance of our troops in hostile situations is a testimony to the value of this kind of realism in training.

I fully understand that I've just given you here a laundry list, but I've done so for a purpose. I want to emphasize that the Navy Department is continuing its commitment to our common goal and that is the most effective and efficient training to produce men and women with skills and qualities required to man the 600-ship Navy and Fleet Marine forces of the 1990s. Obviously, we can't do this alone. We need your help. This conference, as I mentioned earlier, is very valuable to us by providing a forum for us to exchange ideas and information. Hopefully, the conference will also reemphasize to Congress that effective training is vital to the ultimate success of our mission. As you can see, the duty training experts of the Navy have come with me today; Vice Admiral Bill Lawrence, the Deputy Chief of Naval Operations for Manpower, Personnel, and Training, and Major General Jim Day, the Deputy Chief of Staff of the Marine Corps for Training. We will be happy to answer your questions during the panel discussion. Thank you again for inviting us.

Mr. Augustine

Before we hear from our final speaker, let me remind you that we're going to need lots of good questions. Hopefully, you have cards in your brochures on which you can write questions.

Our third and final formal presenter this morning is, of course, from the Air Force -- the Honorable Tidal McCoy, the Assistant Secretary of the Air Force for Manpower, Reserve Affairs, and Installations. Ti is a graduate of the U.S. Military Academy and holds a Masters Degree from George Washington University. A former Army officer, he joined the Office of the Secretary of Defense in 1972, and served in a number of significant positions in the Department of Defense and later was involved in the direction of R&D activities for the Secretary of the Navy. In 1979, he crossed the river to contribute from the other side, where he joined the office of Senator Jake Garn. Ti assumed his present position as Assistant Secretary in June of 1981, and he has been awarded the Defense Meritorious Civilian Service Medal. Please help me welcome Ti to the podium.

Honorable Tidal W. McCoy

Norm, thank you very much. It's a great pleasure to be here with a group that is interested in something that really is quite important. I'd like to thank Norm for coming in from all his busy activities at early hours, and keeping the many obligations that he's got to moderate for us; and all of our speakers for being here and people who are taking time from various important jobs they have; and ADPA for sponsoring something which clearly has got to be focused on to a much greater extent than we have in the past because of the general problem we have with not having quite enough in the way of equipment or people for what we can see are clearly expanding commitments around the world that our President and our Congress feel we should make. We've got to have a higher value added component to all of those pieces of equipment and to all of those people, particularly, therefore, to the training that they receive.

The Secretary asked me to take on the job of coordinating in the Air Force the new emphasis that the Defense Science Board Summer Study brought to training and training technology. I enthusiastically accepted his assignment of that. As you will be able to tell from him later today, he is a great supporter and a great believer in the human aspect and the human element and in the training aspect of our military forces.

I believe that this conference is, in a sense, the natural result of three trends that we have seen over a period of time -- one very ancient, one sort of middle-aged, and one relatively new. The ancient trend is the application of science and technology to matters of combat and defense, from the development of Greek fire which was used against the Emperor Constantine in the 7th century to the most far-reaching scientific inquiry being worked today by a scientist or technician in the laboratory. Technological development is always ultimately applied to military matters. Bernard

and . . . Brody traced that trend in a very perceptive book with a particularly apt title, "From Crossbow to H-Bomb."

The middle-aged trend which I speak of is the explosion and complexity of weapon systems and the general explosion in the rapidity and the change and advance in technology. Even the most cursory review of the technology available for weapon systems or for military application confirms that explosion. In this century, one war -- World War I -- gave a clear lesson of the stalemate that can occur when technology outruns tactical doctrine. One war -- World War II -- was abruptly ended in the Pacific by the introduction of a new strategic technology in the form of atomic weapons. Two wars -- Korea and Vietnam -- cautioned us both as to the promise and limits that may exist in the application of superior technology, and particularly when one is not using and able to bring to bear the appropriate political will and the necessary savvy state craft to make use of that high technology.

Three recent conflicts or events, in the Bekaa Valley, in the Falklands, and in Grenada, showed us that lethal superior capabilities of our modern systems, but when coupled only with the kinds of people who are very motivated, very dedicated, extremely well trained in terms of aircraft, in terms of pilots, extremely high sortie training rates, that the capabilities for quick and decisive action and victorious action is there. Is there in the kind of approach that we believe we should take, both in this Administration and many in the Congress, and I think probably many people in this room.

The relatively new trend that I speak of is the decline of American education, particularly in technological matters. The President has helped focus national attention on this decline, and Secretary Orr, from whom you will hear later on today, will talk some about this subject as well. He has been a strong national voice on this subject. Our moderator, Norman Augustine, in a speech in September, addressed the shortage of science and math instructors, as well, and other deficiencies in our educational system. Perhaps a single telling statistic is sufficient. The average high school student achievement on standardized tests is lower today than it was when Sputnik went up in 1957 and first raised questions about American education.

These three trends interact to work a very serious impact on the American defense effort, as you all realize. The new technology that has always been applied to weapons, the new technology that is coming ever faster and is very hard to absorb by our organizations, particularly when we have people that are not as well educated in the basic science and technology as many people in this room have been. So those are interacting to cause us some very great difficulty, but one which offers an opportunity

particularly for the people in this room and their companies, the opportunity being the necessity for training -- training that is relatively quick, relatively cheap, but yet is very good training and enables the human machine to orchestrate the many kinds of carefully calibrated psychological and motor skills which are going to be required in the judgment and application of the military systems which we're bringing on line. In my view, the Defense Science Board's study on training has done a lot to focus our attention on the broad problem and brings us to conferences such as this where we can address what we need to do to follow on. It focuses our attention on those three trends which I mentioned.

First, we must be better advocates of training. We must be better advocates within our own Services to assure that training considerations are introduced early on in the system acquisition process, and that we do not lose sight of these considerations. We must be better advocates within the DOD to assure that the importance of training does not get lost in the process of budget-making. This advocacy must be at a sufficiently high level that its impact is strong, and I think you can see that kind of advocacy in the people that are going to be addressing this conference. We must be better advocates on the Hill, where we probably have not argued the significance of training as strongly as we might have, in the understandable desire to be about the critical business initially of rebuilding America's military hardware which was allowed to become quite obsolescent during a period of time when Defense budgets were slowly eroded through inflation and cuts.

What we must understand is that training is a part of America's military strength. Like the other elements of that strength, it costs money and we must be prepared to undertake that spending.

The second thing that the Defense Science Board Summer Study called upon us to do, I believe, is to improve information sharing. I have in mind information sharing of three different kinds. In the first instance, you must share with us information as to those technological advances which are available and we must share with you the details of what we need -- and we've got to do a lot better job in that area. In the second place, we must share information better within the DOD so that each Service does not have to discover what some other Service has already learned. We have various initiatives underway to do that. In the third instance, we must share information better within each Service as to the elements which comprise our jobs, the standards by which those elements are to be evaluated, the process by which those standards are to be taught, and the technology by which the teaching is to take place.

The third thing which the Defense Science Board calls upon us to do is to continue and improve the efforts that have already

been begun, both for unit leadership and individual training. For example, we are participating fully in the DOD committee on this matter, and my principal deputy is chairing the Secretarial-level committee in the Air Force on that. It's a very interactive day-to-day process that we work on this.

Let me give you one example of our efforts. The Defense Science Board urged us to develop campaign and battle engagement simulations in operationally realistic war games. We have begun that effort through Project Warrior, our Air Force-wide program to instill war fighting skills, understanding of air power, and development of combat leadership. We are also working through professional military education and the Command Readiness exercise program, a computer-based wargaming scenario, to develop decisionmaking skills of senior officers. As many of know, the Tactical Air Command flag series -- Red Flag, Green Flag, Blue Flag, and the like -- involves the active and the reserve and guard forces, as well as other Services and many other nations which are taking advantage of our great advance in the training technology area in this business to come and participate and really upgrade their skills so that we don't lose pilots in the early first few sorties and first few missions in a combat environment. They've already learned a lot of those lessons in the flag series of exercises. We are working a variety of other initiatives. Key to each of these activities is to use the most sophisticated training techniques we can obtain and to use training devices across the spectrum of these techniques.

These are but a few of the initiatives which the Air Force has underway. We will no doubt touch on others in the discussion which follows.

The recent actions in Grenada demonstrate a truth that must underlie all training. It is this: training must be flexible; training must prepare soldiers, sailors, airmen, and marines to perform specific tasks but not to fight a specific war. In this regard, I was much struck by a passage in Colonel Harry Summers' book on strategy. He writes, "During a briefing by the Army Strategic Assessment Group in 1974, then-Deputy Director of the CIA, Lt. Gen. Vernon Walters, commented that if on 26 June 1950, a Russian spy was able to break into the Pentagon and State Department and steal our most sensitive top secret plans on Korea, he would have found that we had no strategic interest whatsoever in that country." But General Walters went on, "the one place he couldn't break into was the mind of President Truman, and on 27 June 1950, we went to war over Korea." Colonel Summers continues, "American vital interests are determined in large measure in a crisis situation, particularly, by the President alone when he makes a decision to commit American forces to their defense. The resulting volatility and unpredictability of American action promotes both strategic surprise and strategic security, and in doing so gives us a major advantage. At the same time, it imposes an enormous burden on the

armed forces, who must maintain the flexibility to be able to respond immediately to such decisions." And he might well have added that it makes for a tough training problem. Increasing application of technology to training holds out the promise of the kind of flexibility that will be unmatched, we believe, by any other form of training.

I look forward to our discussion. I believe that the stakes in this activity are very high. It has long been the policy of the United States that we cannot match person-to-person our potential adversaries. Our only advantage is in the sophistication of our equipment, the quality of our people, and the quality of our training, as well as the commitment of our people. On August 26, 1346 -- and this is not a wrong date -- an English force under the Earl of Derby met a French force that outnumbered them two to one at Crecy. Those of you who are military history fans know the result. When the battle ended at midnight, the French had lost more than 1,500 lords and knights and an estimated 10,000 other troops. According to one authority, the French suffered more casualties than the English had troops. The English had lost two knights, one squire, 40 men at arms and archers, and a few dozen other troops. Those of you who are military history fans know the reason for that result. The difference lay in technology and in training by those people on the English side, specifically the long bow and the ability to attack moving targets with it, which the English had developed to a high art and which the French had scorned. As the French tried to advance, they were met by swarms of arrows fired by the long bows. The range of the long bows, their stand-off capability, and the training of the men who were using them made the difference. The striking power of the arrows, the throw weight, and the training all led to a massive and very disastrous French defeat. It is because we can no longer guarantee that military disaster will be limited to a single battlefield that this discussion is so important.

I appreciate very much your invitation to be on the panel and to join you today. Thank you very much.

Mr. Augustine

We thank you. Now, to introduce our four clean-up hitters on the panel here who will help in answering the questions. First of all, to my immediate right is General Bill Richardson, the Commanding General of the U.S. Army Training and Doctrine Command, the command which, as its title suggests, has responsibility for all training in the Army. He's a graduate of the U. S. Military Academy, a veteran of both Korea and Vietnam. He served over 32 years of positions in increasing responsibility in the Army. He has commanded both the 198th Infantry Brigade in Vietnam and the 193rd Infantry Brigade in Panama. He was the Assistant Commandant of

the Infantry School and was later the Commander at Fort Leavenworth. Prior to his current assignment, he was Deputy Chief of Staff for Operations in the Army.

Next to him, representing the Navy, is Admiral Bill Lawrence, another Bill, the Deputy Chief of Naval Operations, Manpower, Personnel, and Training. Admiral Lawrence is a graduate of the U. S. Naval Academy, later returned there as the Superintendent. He's a Navy pilot, was a prisoner of war in Vietnam for six years. Before assuming his present duty, he was the Commander of the Third Fleet in Hawaii.

Our third speaker, Major General Bill Charles -- another Bill. As a matter of fact, a moderator with less discretion than I might point to the analogy in training -- whenever you ask for help you get sent Bills. Fortunately, I wouldn't do that. General Charles is the Commander of the Technical Training Center at Shepard Air Force Base. Representing the Air Training Command, General Charles is a command pilot. He was previously Commander of the 320th Bomb Wing. Before assuming his present position, he was the Deputy Chief of Staff for Plans with the Air Training Command.

Our Marine, Major General Jim Day, is Deputy Chief of Staff for Training, Headquarters, U.S. Marine Corps. He holds a Bachelor's and advanced degrees in political science, as well as an advanced degree in business. He has over 40 years of active service, having seen duty in World War II, Korea, and Vietnam. His last command was as Commanding General of the First Marine Division and the First Marine Amphibious Force.

As you can see, we've got a lot of talent here that I think can handle any question that the rest of us can dream up. Let me start with the first question here. That question points out that it's been alleged that many training devices and simulators are over-designed and over-engineered. It is said the contracting authorities require specifications on those devices that are better intended for military use in combat than for use in the training environment, and this results in costs that are too high and quantities that are too low. The question is, what are we doing about that and is, of course, that a real problem still. Let me ask General Richardson to start with that if I might.

General W. R. Richardson

I think the charges may be overstated, at least from the standpoint of the Army. I'd apply that sometimes to weapon systems, but I think in training devices we've been in the habit of writing a pretty good training device requirement that really gets at the rudimentary needs for training devices, understanding that the

complexity brings increased costs, we can't afford that. So we've tried to be fairly simple in not over-designing. There have been a few examples, but I think the trend now in the Army is to be fairly simple, get out for an early test by the user so the user can understand exactly what the systems do, see whether it follows the TDR, and then ensure that we proceed on with the development. So I think we are quite concerned about increased costs, but I believe we've got a handle with those who do the development work for us to ensure that we retain the simplicity in the device.

Mr. Augustine

Let me turn to another question which says that in order to provide adequate training for the troops and their leaders, what in-roads are being made to training current and future training managers to support the complex management of high technology training systems. In other words, what are we doing to train the teachers, to train the trainers? Let me ask General Day to address that.

Major General James L. Day

We have a system that is not elaborate on training the trainers. We do have one where we have cross fertilization with the other Services; we have people that specifically work with our development center; we have those that work with NTEC. We run the whole gamut as far as training our people, because we believe that that's where we get to our multiplier or force multiplier, having a good training system.

General Richardson

One of the things we've found, we found in 1973 that in our Service schools we were training people, officers and non-commissioned officers, how to use a system or to understand a system or how to apply tactics and techniques, but we weren't taking the second step until we learned something from the British -- that you in fact had to train the trainer how to do that. In our Service schools we began that. We still are not completely there, but in the process, what we've attempted to do is instruct them on all the methodologies available, not only a battalion training management system itself but all the training devices that are there to assist them. Now this is very important for Reserve components and we've made quite an emphasis through the Reserve component house, to include the Forces Command folks, to instruct them on what is available and out there, publish the literature, get it out to the field, bring them in so that they understand that there is a system that we have that can help in that. Now, where it comes to fruition is in the preparation for the National Training Center experience and that's where people understand to

prepare in a short amount of time, they've got to use every conceivable training simulation, training simulator capable of doing the substitution for the opportunities they are missing by not being able to get out on the ground. So the education in the TRADOC schools, I think, is beginning to pay off to the folks who then filter on out to the field.

Major General William M. Charles

The key, I think, is the human element. No matter how sophisticated the training systems are, of course, you've got to have people who understand the training systems and people who know how to train. So I think the instructor is the key in the training process. In our Training Command, we make that assignment as an instructor a unique assignment, even so far as having the instructors wear special badges and trying to motivate them into being an instructor in the first place, and then a professional instructor in the second place. Both in basic military training and then the follow-on technical skill training at our four Technical Training Centers, we make that job rather a unique job and a competitive assignment. But in my view, that is the key to success or failure of any training or training system or training technique -- the kind of people you have and the training that you give them to teach them how to teach.

Mr. Augustine

Here's a question for Admiral Lawrence. The question is where is the Navy going relative to the use of advanced computer managed and computer aided instruction?

Vice Admiral William P. Lawrence

I think we're off to a very good start in this particular area. Some of the practical applications that I see right now -- for example, in propulsion plant training for the 1,200-pound steam system which we have on many of our ships today, we have a very good computer based instruction called the steamer system which is provided up at Newport, Rhode Island and also at Great Lakes. We're getting some very fine results from that in training people to operate those complex plants, to respond to malfunctions that occur and so forth. Another area where I think we're making great strides is in what I call the tactical gaming simulators, where we take desktop-type calculators, computers, and are able to run simple programs. For example, anti-air warfare, ASW, a moving tactical situation is depicted where those that are involved in the game have to make decisions and you have both an enemy and a friendly force competing against each other. This, to me, has very great potential for employment. So I think we're doing pretty well. I think there are a lot of challenges that remain for us in this whole area

which is a vast area of great potential, but if it's not managed properly, it will give us some problems. I think we've got to standardize the software that we employ in these computer based instructional devices, look at life cycle costs, and all those managerial practices that you want to apply throughout the acquisition field. So I think there's great potential but it's an area that requires very intelligent and careful management.

Panel Member

I'd like to add one thing to that. We have to watch where we're going on our computers, on our training. We know that we need them in the upper echelons; we also know that we need them in the field as tank trainers, maintenance trainers, command and control trainers. But we know that we also have to take a real good look at do we need 100 percent of computers out there to assist our effort in the field? Do we need 50 percent? Or do we need something in between? I say this as a caveat because as I travel around and talk about training, and particularly about computer assisted training, we find individuals that are almost drawing a line between their training programs and computers, and we've put it there on an upper level because we said you will have this type of training, when they feel, in fact, that they can do a lot of training without sophisticated computers. We know that we need them but we don't know to what degree we need them and that's what we're going to need some assistance on from you to develop that need and to what degree.

Mr. Augustine

Here's a good one for General Charles. It says that there's a strong feeling that due to the Carlucci initiatives, everything must be competitive. It appears that this destroys individual company initiatives to develop new concepts. The question is is there a procedure whereby a small company -- and I'd like to generalize this to include large companies -- can be assured of a sole source contract for a new conceptual trainer, assuming a requirement for the device has been established.

General Charles

Good questions! Keep them coming! Sole source versus competitive bidding, as far as the user or the customer is concerned, naturally we're looking for the lowest cost-effective system to meet the requirement that we have established. Whether it's a small company or a large company, in my view, I think if we can find a company that can provide the system that we need or think we need and it's the only company available, of course they have their foot in the door, but if there are several companies available, we ought to go competitive bidding. I think it's just good common sense as far as the customer is concerned.

Mr. Augustine

Here's another easy one to follow on the heels of that easy one. This one says the training funds are largely O&M funding, which, of course, expires annually. With the inability of Congress to pass appropriation legislation, this has been damaging to training programs. What, if anything, are you going to do about this? We need a volunteer for that, so I think we will ask each of our Assistant Secretaries to volunteer in turn. We'll start with Jay, if you could talk about what is being done to solve that problem.

Dr. Sculley

I'll have to beg the question a bit on O&M money, since it doesn't fall directly in my area of responsibility, but I would also add that it's really incumbent upon us in Defense, and specifically the Army, in my case, to make the case in such a manner to the Congress that we merit and warrant their support of our training programs. I really can't pass the buck any further than myself on that issue. If we're not getting the support we need for these programs, then we're just going to have to do a better job of justifying it, quantifying it to the Congress. I know that I can do better.

Mr. Cox

I don't know if I can answer the question any better than Jay has. We don't have any intention of trying to change our constitutional process and this is something we have to really labor with. It's hard enough to get multi-year contracting on hardware programs, so we're not going to get it on O&M funds. So the answer is that we've got to do a better job in the Services of justifying our program and justifying our training program to Congress. I guess one way we do that is to show what we're all here to talk about, that the training dollar is a cost benefit. The dollar is one of the highest pay-off dollars that we spend and if we can show Congress that, I think we're better off. We have to show the benefit of those dollars spent and we also have to show that the training dollars are part of a comprehensive, well-reasoned program.

Mr. Augustine

Ti, would you like to be the final volunteer on that question?

Mr. McCoy

I'll be glad to volunteer just a couple of comments, also. I think the other two gentlemen are correct. We've got to create the visibility in the Service budgets for where these things are

located, and I think that's one thing that the Congress is always suspicious about -- items they can't quite get their hands on; they know it's in there somewhere and consequently they think if it's hidden and not visible, it must not be that good. There's a natural inclination of that sort. We in the Air Force are solidifying all of the R&D for training technology into one program element and the procurement in one appropriation for training devices so that we can show it all and show that we're not trying to hide it, it's not scattered around; it's good stuff and we're willing to have it all in one place and visible, and to talk about it and justify it. Then, in keeping with the people in your industries, need to develop not only the equipment and how we fund it properly and how we define the user requirements, but the way we measure the effectiveness of it so that we can show the effectiveness of the training devices and the training dollar. We've got to work on that in the military departments ourselves. We can then go to considering things like multi-year funding of certain kinds of major training efforts, training ranges, training technology. At the same time I think we shouldn't be too reluctant, although in a nice way, to make the point to Congress that in the O&M appropriation, as well as in a lot of others, the delays that we face in achieving the appropriation is a very costly business and the volatility that the Defense budget is treated with sometimes really increases costs dramatically. We don't have the kinds of stable programs we need to do things, so that the Congress, many times, despite its efforts to do the right thing, doesn't always leave us with the ability to manage in the most effective way things such as Senator Nunn's initiatives and thoughts about a two-year cycle for authorization and appropriation, various things of that sort that are sort of more macro approaches from the Congressional end, I think are well worth studying and encouraging.

Mr. Augustine

Here's a question on a very important subject -- language training. I think I'll ask General Richardson that. The question points to the issue of what efforts are being devoted to the matter of generating language training proficiency, not only AIT but retraining voice linguists who have lost or are losing their proficiency. Bill, would you want to handle that one?

General Richardson

Yes. First, let me say at the Defense Language Institute, which the Army is responsible for running for all the Services, we're trying to bring some of the methodologies up to modern times using modern equipment and technologies that are available out there that we have seen and used. So we hope to raise that so that at the input, the beginning of that training program -- and that's both for the foreign language individual who's going out in a security systems role, as well as the intelligence specialist --

we can do a better job. Second, you're absolutely right; there are all sorts of video disks, interactive capabilities, and micro-computers that would allow us to be able to put some of that material out with the units so that they could have tapes that are available for intelligence training, tapes available for pure language sustainment training, and then opportunities to use that at various places out in the field that is related to the kind of work that they are going to do on a day-to-day basis or when they have to come back into the system into a job. It's there. It's just a matter now of getting it moving, getting some emphasis behind it, putting the money to it, and getting the tapes and the requirements out in the field. A lot of money can be made there, I think.

Mr. Augustine

One of our participants this morning points out that U.S. Forces have been outnumbered in both manpower and equipment for some time, and raises the danger that we might be out-trained in the future. The question is what do we know about Soviet Warsaw Pact training techniques and training equipment, and in particular, are there any lessons to be learned there for us. I don't know who would like to take that -- perhaps Admiral Lawrence, would you want to start out?

Admiral Lawrence

I'm really not all that knowledgeable about their basic training establishment in the Soviet Union. I know they give a great deal of emphasis to this. They have, it is my understanding, far more schools for training officer personnel than we do in our country. I can speak from the aspect of watching them as a fleet from two years of almost continuous interaction with the Soviet Navy and Air Force, primarily in the northwestern and northern Pacific arena. They have a very highly structured type of training regimen. They are not given the latitude that we give our forces and at-sea commanders to go out and conduct exercises involving multiple units and multiple forces. They give a great deal of attention to basic ship training, individual ship exercises, build up to two or three ships on a progressive basis, and very rarely will they have large-scale fleet exercises which we conduct on a continuous basis. It is obvious, from my perception, that what they do in peacetime is very centrally controlled. It's planned out over a long period. So I've often made the comment to our own people that maybe we should take a lesson from the Soviets as to how they do their long-range planning for their fleet training because it is obvious to me that they give a lot of thought to this, but they do not get to the advanced, complex state of fleet exercises that we do. That's where I think that we are fundamentally superior, that we're better at operating in group configurations that we'd have to

fight in in wartime, so that's somewhat of a rambling answer, but it gives my own perceptions from two years at sea with the Soviets.

Mr. Augustine

General Day, would you want to treat that from the perspective of the ground forces in terms of lessons learned from the Soviets' training.

General Day

From a land standpoint we know how the Soviets operate on a corps, on an army, on a divisional level, and even down to company grade. I think the mistake that we sometimes might make is saying that the Soviet or the threat is not an imaginative person, that he operates the same way today in Afghanistan as he operated 40 years ago on the German-Russian front. He uses the same tactics, he uses the same techniques, he uses the same type of support, whether it be a direct combat support, whether it be artillery or air, and he probably won't make that change. I think we're now seeing an evolution in the type of commander he has. Not only the type but the different commander. He's starting to get a younger commander; he's starting to get someone that was completely alien to the operations in World War II. Although we train to counter his thrust, we train to counter his maneuver warfare capability, we train to counter his static capability, and we train on the lower level, on the squad level, about going up against a company of the threat or going up against a squad. We know what type of weaponry he uses. We still say that he's probably etched in perpetuity as far as changing his tactical means and what he's going to do in maneuvers. This is what we have study; this is what we have to acquire from the forces that do have that capability and do have the information. We think we train pretty well toward that threat, but we don't know if we're training completely toward it because we don't know how he's training today.

Mr. Augustine

I'd like to ask the next question of General Richardson and General Charles -- General Richardson from the standpoint of rotary wing aircraft, General Charles from the standpoint of fixed wing. The question is what is your opinion about the overall use of flight simulators versus actual flight for training? Are we using simulators too little or perhaps too much, or do we have the right balance?

General Richardson

I'm not sure we're using them enough, but we have caught up in the last couple of years by making the adjustments in our training program down at Fort Rucker, by bringing in the simulators and trying to acquire sufficient amount of time there to save us time,

money, and the experience through initial rotary wing training. Where we've missed out is in the ability to get enough simulators in numbers out in the field so that the folks in the field can continue their proficiency, can use the simulator and save flying hours and fuel, spare parts, and the rest. That simulator enhancement program is on the way and in time, major installations such as Fort Campbell, Fort Hood, and other places will have the flight simulators. Now what are we talking about? The UH-60, 47, UH-1, the AH-1S, and the combat mission simulator, the AH-64. Now, the latter one has trailed a little bit, disturbs us a little bit, and we've just tried to play a little hard ball there saying that simulator has to be not only available at Fort Rucker but also out in the field. It is our effort in the Army to try to force the community to accept the fact that we're not going to field a weapons system unless a simulator comes right along with it and is fielded at the same time. When you get Jim Ambrose backing you up on something like that you can generally make it stick. So we are improving the total simulator usage for helicopters and we'll probably expand it because those flying hours are costing us so much in spare parts and time, we want to take maximum use of it and it's proving very, very beneficial, both at Rucker and out in the field.

General Charles

From the Air Force point of view, the Air Training Command in its undergraduate pilot training program went to a sophisticated system of what we call instrument flight simulators a number of years ago. In order to do that, we had to provide some trade-offs in flying hours because flying hours cost money. We went from a flying training program of something over 200 or 220 or 260 -- I can't remember the exact flying hour program that we had at that time -- down to about 170-172 hours in flying training, pilot training prior to receiving wings. But we found that we had cut too much of the hands-on flying out of the program and relied too much on the simulator to teach instrument flying skills. It was so bad and we had cut so much out of the flying training program that the first time a student flew an instrument flight, he was flying his check ride in instruments. All of his training had been done in the simulator and the failure rate went up astronomically. We realized that we had cut too much and we had to provide some hands-on in-the-airplane training in instruments prior to throwing a fellow out on his own for a check ride. So we added back a few hours of instrument training in the airplane and now the program is about 175 hours. But that's 175 hours in the air and add to that about 60 hours of IFS, or instrument flight simulator. We have a program at Sheppard called . . . for Euro-NATO Joint Jet Pilot Training Program, a program where we train approximately 250 student pilots from NATO countries to include about half of that for U.S. Air Force. We do not have the instrument flight simulator at Sheppard. We have a program that

has about 260-265 flying hours. There are two basic reasons, I guess, that we don't have simulators at Sheppard. One is because many of the NATO countries are not necessarily convinced that simulators are the way to go in lieu of the cost -- and that's the second reason, because they are expensive and NATO countries weren't quite ready to step up with the cost of putting IFSs in this program. But we think, in Air Training Command, that simulators are the way to go to cut down flying costs. However, there is a danger in thinking that we can trade one for one -- one simulator hour equals one flying hour. That is not true. There are a lot of things that we can do in simulators that we can't do in the airplane. Emergency training, for one, emergency situations that you would not want to put the airplane in you can do in the simulator. You can repeat over and over again and do it rather rapidly, and with the latest systems you can stop, freeze in flight, review, back up, go back and do it again, and so forth. So simulators are the coming thing, particularly with the computer generated imagery and wide view screens and so forth, as long as we don't try to make it too sophisticated. But simulators certainly have application in Air Training Command, but -- with a caution -- not a one-for-one trade-off.

Admiral Lawrence

The experience that Bill Charles outlined I certainly concur. It has been our observation in the Navy that simulators have helped us immensely in Naval Aviation. I think that our improvement in our aviation safety, much credit can be given to simulators in this regard, particularly the night carrier landing trainer. Night carrier landing is a very difficult maneuver and the beauty of the trainer is that you can go out and just do this on a repetitive basis, so some of the basic skills of doing that evolution are acquired and then go out in the airplane in the actual condition and reinforce those. But it takes a lot of analysis, a lot of wise people determining what the proper balance is and I think right now we have achieved a pretty good balance between what we actually fly in the air and what we do in simulators, and I would be very reluctant to cut down any more in-flight experience for our pilots with the simulators that we have right now.

Mr. Augustine

Ti, it's pointed out that we can often field very good training equipment, but we have difficulty keeping the equipment current. Is there any initiative to correct this?

Mr. McCoy

I think that we've got to, in the design requirement for the equipment, make it clear to the manufacturer as well as to the weapons system manufacturer that as we move forward and modify

the weapons systems which we have, and of course a lot of them we're getting are very expensive and we're going to have to keep them a long time -- like the B-52s, they'll probably be around 30 or 40 years -- and there'll be a lot of changes that they'll go through. So we've got to have the ability, hopefully, in sort of a modular context, maybe with some line replaceable units there as well, to modify those training devices, particularly the ones that come along. As far as going back to the other ones which we currently have, that's a little bit more difficult problem, but clearly, as part of the requirements definition process, which we hope to get better organized in the military departments, that's got to be something that's undertaken and goes hand-in-hand with what the weapons system people are doing and what the SPOs are doing.

Mr. Cox

Could I add something? I think this is an area that we in the departments have to pay a lot of attention to. There's a broader macro issue here that we've been struggling with in my office, and that is the integration of the whole training continuum to try to make sure that our training program in the macro sense makes sense not only to the people that are in the acquisition bureaucracy, but also the people that are the end users in the Fleet and also the people that are in the schoolhouses. This is a very difficult problem that cuts across a lot of institutional barriers, but we're struggling with it right now and the effort is to try to pare out the redundancy and to try to update our systems regularly, and to make sure that the Fleet and the schoolhouse and the people that are involved in the acquisition are all going in the same direction. It's a good question and there's no real easy answer to it except that we're struggling with it and we think we're making some improvement.

Mr. Augustine

The next question relates to the MILES equipment. I guess I should address this to General Richardson -- perhaps General Day, I don't know. Do the Marines use MILES? Yes? Then let me ask you each in turn. The question is how has the MILES equipment affected marksmanship accuracy, especially against moving targets?

General Richardson

It has had a total revolution in terms of not only accuracy and attempt to kill a target -- and that's anything from the M-16A1 all the way up to anti-tank target. I think the most important thing is that it has taught us a lot about covering concealment, ability to use fire and movement properly on the battlefield, and truly get down to understanding how to use everything out there in order to keep from being killed. It's embarrassing when you go there at the National Training Center and you're getting killed

right and left. You quickly adjust yourself to that. It has taught our people the importance of ground, if nothing else. One of the things we have a problem with is that folks get behind a hill and therefore they're not playing -- the artillery is coming in on top, so we're trying to get some of you folks out there who are doing the business of finding indirect fire simulator systems to be able to give us that artillery which will dump in on top of them. We've got something that might be coming along very soon on that, but that would assist. The important part of MILES now that we're looking at, besides the M-1, M-2, and M-3, is MILES AEGIS-AD. that's air-ground engagement system, air defense. We will put that on our helicopters, we'll put that on Chaparell, Vulcan, and Stinger. So when you play it out there, the aircraft are not immune from those ground attack systems which will be able to shoot them with the laser. And the same thing with the helicopters up there shooting on the ground. Heretofore, we don't know whether the helicopter is being shot out of the air or not, or whether the folks on the ground are getting a tank kill from the Cobra. Now, that will go in the National Training Center next year and you better believe it -- there are going to be some substantial changes or adjustments in how helicopters are flying and how the air defense system is going to work. So we are extremely delighted about that opportunity.

General Day

We look at MILES in the same way. We conducted an . . . test out in California at Fort Hunter Liggate a few years ago and one of the greatest pieces of information that came from that is how effective these young men can become with the use of MILES in a short period of time once they become used to that particular type of training aid. This is an example, I believe. A while ago when you were talking about simulators and you were primarily talking about the aviation side, where a simulator has really put us on top of the heap. It's a good program. The Army and the Marine Corps sometimes become chastised because we talk about training on the squad level and what we can do for that man down on the squad. Well, the MILES system has shown what we can do for him and probably the biggest thing it has brought forth is that if a man doesn't take advantage of cover and concealment, if he doesn't follow the basic dictates of the training, he's going to have it handed to him. It's a tremendous system and we're very pleased to have it.

Mr. Augustine

The next question I would like to address to you, Jay, and then to Bill Lawrence. The question is has any thought been given to requiring training effectiveness evaluations on every training device that we produce.

Dr. Sculley

Certainly it's been given a good deal of thought and particularly, again getting back to aviation -- I've asked the developer and the user the question in looking at training systems, how much is enough to evaluate or begin to evaluate existing systems in order to learn from those systems how we ought to go about designing future systems. We talk about cost and complexity and sophistication and computer generated imagery. But we still don't understand, to meet any satisfactory level, the impact of training on a training system and translating that training to the system itself. It's a bit of an art, if you will, and it needs to be much more of a science. The answer to the question is yes.

Admiral Lawrence

I'll just mention what is probably the most debated area in the Navy, and I'm sure in the other Services as well. You have training to enhance the readiness of your forces, and then the question comes up, how do you actually measure the readiness of your forces and that's really the tough one. We have our . . . system, where we have the sea ratings and all of that, but there are still those fundamental judgments of operating effectiveness, how you would perform in a certain combat scenario, that to my view are still largely subjective. I'm throwing this out maybe as a challenge to this body here; in addition to addressing what we need in training, you may help us in being able to measure the readiness of the forces. Just to add to what the previous gentleman stated there, we're looking, in the Navy, at doing a better job in assessing the cost effectiveness of training systems, both those in existence today and those that we have planned for the future. My assessment, after one month in town, is that we probably are not doing a very good job at this and we really need to do a lot of work. But one of the things that I have been briefed that we are doing is to try to generate and develop a generic data base which gives some of the cost effectiveness parameters and data that might be common to other systems that are being developed so you can compare those systems that are in development with existing systems on a more intelligent basis to determine whether or not you truly need that system. We haven't really gotten very far in developing this generic data base, but I think it certainly is a step in the right direction and maybe those of you here can help us in doing that job.

Panel Member

We had, two or three years ago, something called a cost training effectiveness analysis, which was a paper analysis trying to make this case we're talking about. We found that it really wasn't very effective. So what we did was develop a needs statement early with some assessment of what that would save in terms of cost. In

other words, it was more back of the envelope. And I think that's been coming along fairly well. So we use the CTEA after the system is out so that you can improve the effectiveness of the training as you see the capability of the training device to enhance your training, for one. The second thing that I think really has been helpful to try to show the difference is to put something like substitution or simulation or miniaturization into gunnery practice. We've done this out at Gowen Field in Idaho, where we've compared a baseline case of tank gunnery by National Guard units that have actually completed all the tank gunnery tables with live ammo, and then compared an alternate group that's done no live ammo but gone through miniaturization, substitution, and simulation. Interestingly enough, the folks that went through the whole simulation system had scores that were just as good as those that fired live ammo. So that taught us an awful lot and right there you can figure out the equational difference of what the cost is of the system against the cost of live ammo -- something that has been eating us alive in training costs. So it's that kind of comparison that we have found very useful to us as making the cost effectiveness argument for training devices.

Mr. Augustine

Chapman, a question here points out that population forecasts indicate a continuing decline of people eligible to serve in the Armed Forces, but at the same time we hope to have a 600-ship Navy. The question is are we going to be forced to lower entry qualifications, lower manning levels, or what, and what's the impact of all that on training?

Mr. Cox

That's a good question and we don't have the answers to it because we don't know what is going to be the impact of various demographic factors in the future. Yes, I think the forecasts of having fewer people in the pool are probably true, but the ones that are really tough to deal with are what's going to happen to the economy if the President continues to be successful in his economic efforts, and if the economy does continue to get better, how is that going to impact upon a recruiting situation. We don't know the answers to those questions. We anticipate that it's going to be tougher, which means that we may lose some of the advantages we have now. Right now we're recruiting more than 90 percent high school graduates and we may have to fall off that a little bit. It means that if we do experience that problem, we will have to increase our efforts in training, and some of the things that were mentioned earlier in the speeches relating to more direct use of technology to give us some advantage in dealing with people at a lower intellectual level, I think we're going to have to use. I know I'm rambling. We don't have an answer to it. We are concerned about it, but right now we're very optimistic because of another

sort of subjective factor that is not part of the science which Jay was talking about, but part of the art of training people, and that is that our morale is higher today than it ever has been and that sort of X factor is really helping us in our training business, as well as in our other businesses of manning the force. The troops are proud of what they're doing. They have a much better environment in which to work, and so they're working harder and being more productive. So I think that's another thing that we have to be careful to preserve, as well as maximize our use of technology.

Mr. Augustine

Let me ask this next question of General Charles. Bill, the question points out that a recent article in the Wall Street Journal reports an Air Force decision to pursue its own aggressor aircraft program instead of buying the real thing, namely MIGs from Egypt and other countries at substantial savings. The question is why are you doing that?

General Charles

I don't know. I can't comment on that one way or the other. Frankly, I just don't know.

Mr. McCoy

I don't know the details of that, either, Norm, but there is a requirement to maintain, at least within the Force, a capability for a certain amount of cost effectiveness in the aggressor program. Sometimes that's better maintained by having aircraft which, while they have similar flight characteristics, are U.S. made and have some easier ability to maintain. So some of those kinds of trade-off decisions I'm sure are involved.

Mr. Augustine

Let me ask you another one. Is there any plan for the Air Force to get involved in engagement training -- the questioner specifically points to MILES -- with the Army and the Marine Corps?

Mr. McCoy

I'll have to beg ignorance on that. I don't know, but I was just thinking as some of the earlier questions were being answered, particularly regarding the work that goes on down in the Langley area between TRADOC and TAC regarding the development of doctrine for the use of aircraft such as the A-10 in conjunction with the helicopter force in support of the air-land battle 2000 concept, so I would think that if we're not doing that, one of the questions I'm going to ask when I get back to the building in a little while will be what are we doing to hook that up.

General Day

Ti, I just got back from El Toro and there is a squadron of Marines who fly F-18s out there that just got back from Las Vegas and I won't say anything about the results of their exercise with the Air Force, but the Marines were very proud.

General Charles

We have a number of joint exercises going on every year involving the Army and the Air Force, TAC and SAC and MAC supporting the Army, not only in this country but also in Korea and overseas. So there are a lot of joint exercises in which we are providing force multipliers, so to speak, for Army engagements. The Red Flag -- of course that's a well-known flying exercise, flying test ground, training arena for all of the Services, run under the auspices of Tactical Air Command.

Mr. Augustine

Let me ask one of General Richardson on range training equipment. The question is, the large number of companies displaying range training equipment in the exhibit area would lead one to believe that such equipment is widely available now and off the shelf. If this is true, why the alleged long, drawn-out IRETS development program?

General Richardson

IRETS has had some difficulties in the past. It requires a good bit of construction, it requires some new adaptations on movement patterns. To be able to put the engineering design in at a decent cost -- as you know, those of you who do know about it, we've got a number of them around the world that we programmed for, so once we put the money toward IRETS we need to pursue that. It does not mean that our folks at the Army Training Support Center are turning their backs on any other opportunities that you folks have got for them to look at, and they're here today and they'll be here this week to see any other opportunities that may be there, especially if they're lower cost or they're simpler. We're not going to turn off any opportunities for looking at range capabilities, whether it's the IRETS, which we are embarked on and we'll probably continue on that one, but any other adaptation that would be useful. We're looking at scale ranges and different types of weapon systems, and ability to fire not only from point position but also from moving positions. We do not want to just simply have tanks sitting down behind a bunker firing directly ahead; we want to be able to put tanks on the flanks to be able to move and fire in pairs or threes or fours. That means opening up the range areas, which is our biggest problem right now of getting enough territory to be able to do that on most of our installations. And

then we have to crank in the ISAFE laser problem that's going to be out there with the M-60A3 and the GLID weapons with the Copperhead that causes some real problems. So we are not shutting our eyes or our ears to any suggestions and we'll look at anything you've got.

Mr. Augustine

We have time for one final question here which I would like to address to Secretary Sculley. The question is one that a number of people put in in one form or another. Basically, it asks what can we workers in the R&D and procurement area do to better help you increase and defend the training device budget, particularly in defending it with the Hill, the Congress, the OMB, and the Office of the Secretary of Defense.

Dr. Sculley

I can't get into the lobbying business, but just your very presence here at this conference in Washington, your past attendance and support of this ADPA program in Orlando is very much appreciated. The driving reason to have the conference here this year, hosted by the Air Force, and again here next year hosted by the Army, was primarily to get this subject out in the open in our nation's capitol and in front of the Congress. I'd be glad to discuss any specifics with you individually in my office at any time. It's something that I think collectively we feel has great pay-off. Training does pay off in the form of readiness and I just ask your continued support.

Mr. Augustine

I'd like to thank each of you in the audience for the fine questions. Unfortunately, we have a lot of them we didn't have time to get to and what I plan to do is give them to General Miley and perhaps ask that he have them typed up and given to each of our speakers so they'll know what's on our minds.

I also want to thank each of our panelists for being with us this morning, as well as the ADPA for making it possible for them to be with us today.

LUNCHEON MEETING

NOVEMBER 14, 1983

Due to technical difficulties, the introduction of the Honorable Verne Orr, Secretary of the Air Force, is not available.

Honorable Verne Orr

. . . . . on-the-job training at much greater cost. We have now built that back up until at the present time we're averaging about 12 weeks, and if money and possibilities indicate, we'd like to go even higher.

Last Thursday I visited Lowrey Technical Training Center near Denver and I watched our munitions handlers learning their trade. They were actually loading on an old B-52, and General Usher, who was escorting me, laughed and said, "There's a B-52 that doesn't know what it is. Under one wing it's a "G" and under the other wing it's an "H"." They differ and our munitions handlers were learning how to load the munition in two different kinds of simulated conditions. He also pointed out that in the corner was an old wooden mock-up, which we had previously used in order to teach them munitions handling. Something which I think is very important for all of us to remember is there is a vast difference between loading on an actual airplane and loading on a simulated mock-up. The two can't be compared. There is a spirit of realism when you load on the real plane that is absolutely missing in a wooden mock-up.

Another thing he stressed to me is that with the rapidity of the changes we're making in planes, it is absolutely useless to train someone on a discarded B-52A and then send him out in the field to work on a G or H because the conditions he finds are so different that his training is very nearly wasted. Training, I think we all recognize, must be realistic to be valuable.

Two weeks before that I had the privilege of being at Little Rock and I sat in a simulator of the C-130. Now, most of you in the audience have probably seen the American Airlines commercial and I think it's a good one, where you see a pilot and co-pilot who apparently are landing a heavy plane at the end of a runway and when they finally bring it to a halt, the lights come on and you find that the pilot and co-pilot, in reality, were simply sitting in a room at controls and it's a simulated landing. Our C-130 is exactly the same kind of simulation that you can see there on television with the exceptions that in our C-130, after they take off, you find puffs of ack-ack flying around you and

tracers coming at you, and pilots who have served in Vietnam say it is so realistic that they emerge from a time in the simulator perspiring and very nervous. It is realistic. Incidentally, we are using the American Airlines simulator to train our KC-10 pilots and we estimate that using commercial sources, we will save up to $90 million over 20 years in training those pilots. We are now talking about, although we have not yet signed contracts, doing the same thing in our C-5Bs and our AWACS.

I have witnessed simulated alerts deep in Titan silos. I have had the opportunity to fly thousands of feet in the sky during an exercise in the National Emergency Airborne Command Post, when the exercises are not known whether it is realistic or simulated. The training is excellent. Douglas MacArthur once said, "In no other profession are the penalties for employing untrained personnel so appalling or so irrevocable as in the military." We have got to redouble our efforts. Years ago, we lost the quantitative edge to the Soviet Union. I could stand here and tell you facts that you know -- that this year they'll build 1,100 fighter bombers and the United States Air Force will get 200, or all of our allies, taking NATO countries and the Navy, and altogether we will produce less than half the Soviet Union's. I can go through the fact that they will out-produce us in tanks, out-produce us in submarines, and even, as you may know, that in space, where we're very proud, we will put up 13 space shots and they will put up 100. But the more serious matter to me is the fact that our qualitative edge is narrowing. They're going to out-produce us in engineers this year five to one. They're going to offer their high school students eight years more hard sciences than we will, in algebra, chemistry, calculus. Our aptitude scores in high schools have been steadily going down in the years since Sputnik was introduced. Teaching in our country no longer remains the prestigious, happy job that it used to be. We have always paid our teachers rather poorly, but community acceptance and job satisfaction made up for it. Now there's very little public appreciation and there is certainly no job satisfaction in many cases. There is today such a shortage of math teachers that a third of our high school graduates will not have enough math when they graduate to enter a qualified engineering school. We and the teachers, working together, must change it. The teachers must accept the fact that we have to have a differential in pay for a differential in quality. Up to this point, they have quite insisted that every teacher teaching the same grade with the same educational background should receive exactly the same amount of money regardless of differences in the quality. They must get over that idea; we must also make it possible for them to be paid in some relationship to the difficulty of their job. I think we all recognize that teaching in inner city schools is far more difficult, in many cases, than teaching in the suburban schools and pay should be proportionate. At the same time, we've got to recognize that you can't have quality education for discount, basement prices. We've got

to raise our sights. The Commission on Excellence in Education in its report to the President very recently said we must strengthen the teaching profession by making teachers' salaries competitive, market sensitive, and performance based.

As the Colonel indicated, I was Ronald Reagan's finance director for five years while he was Governor of California. California is not different from many states in that education was largely paid for by the property tax and welfare was largely paid for out of the general fund, and there is no tax that is more difficult for people to accept than the property tax. Most of you are familiar with our Proposition 13, the property tax revolt, which has been copied in many other states around, and I often wonder what changes there would have been in society if we had paid for education out of the general fund and paid for welfare out of the property tax.

We, today, are training the most outstanding young men and women that have ever entered the Air Force in its history. Our new recruits, this past year, were 98 percent high school graduates and as a matter of fact, in August just past, we brought in 4,200 non-prior Service recruits and 4 of them did not have high school degrees. Our reenlistment rate is tremendous -- 66 percent of all those eligible are reenlisting after their first term. Among officers, the education is outstanding -- 43 percent of all our officers have either Masters or Doctorate degrees. In the new Brigadier General list, which I studied recently, 85 percent of all those selected for Brigadier General had either Masters or Doctorates, and I suspect the time is coming in possible 5 or maybe 10 years at the most when you will hardly select an officer in the Air Force for General Officer slot who does not have a degree well above the Bachelors.

One of the things that disturbs me is the age at which our people are leaving. Our enlisted personnel normally opt out at the maximum of 28 years. If they came in at 18, as many do, that's 46 years when they leave us. Our Colonels leave at 30 years; our Brigadier Generals must leave at 32, and our four stars can serve no longer than 35. So if you figure that our people were commissioned at about 21, 56 is the longest that an officer can stay with us. Now, that's a lot sooner out than most companies manage and I wonder if the time has not come in the military to think about keeping these highly trained people over a gradual increase by as much as 5 years more. The present system came about because Eisenhower felt in World War II that his officer corps was too old and as President, he was instrumental in changing so that he got a younger force, but it is entirely possible that we have swung the pendulum too far.

I've just been reading the story of General Albert Weidemier. He served 17 years as a Lieutenant, pre-World War II -- not an unusual time, if some of you have been reading stories about it; I won't suggest you were alive then. It was not unusual to retire

in those days as a Major and consider that you had worked your way pretty well up the ladder. Possibly, we should now begin to think of maintaining this trained cadre of individuals for a longer period. There is an ancient Chinese proverb that says, "The more you sweat in peace, the less you bleed in war." Rommel also said, "The best form of welfare for troops is first class training." And Ronald Reagan only recently said, "We Americans are still the world's technological leader in most fields. We must keep that edge, and to do so, we need to begin renewing basics. While we grow complacent, others have acted."

In the Air Force, may I tell you that we plan to train and train, and we expect to be as ready as all the Services were a few short weeks ago in Grenada. We expect to train effectively, intelligently, and economically. In doing so, we expect to work shoulder to shoulder with the industries that those of you in this room represent, because only working and training intelligently and only working in cooperation can we expect to hand down to our grandchildren freedoms that we have enjoyed handed down to us.

Thank you very much.

NOVEMBER 15, 1983

MANAGEMENT PANEL

Brigadier General Benjamin J. Pellegrini

I'm Ben Pellegrini and I want to welcome you to the Management Panel. We have a lot on the agenda this morning in the next three hours. What I want to do here very briefly is give you a short background as to what we did to get to where we are this morning.

We've had many meetings over the last six months and I do owe a debt of gratitude to Ron McDivitt and his Technical Committee who assisted us on the panel in getting us to focus in on the issues which you in industry and we in government feel are important in regard to trainers and simulators. Clearly, our thrust has been the theme of this conference and that is to make an overall awareness, increase an overall awareness of increased readiness through training.

On our first vu-graph, our thrust was portrayed here on these slides. We looked at the overall process to see what the expectations are; we attempted to identify the challenges and constraints. From that, what we plan to do this morning is really focus in on the issues that we feel are important and must be addressed, and hopefully come up with a resolution. We may not resolve all of them, but if we achieve a principal purpose of having people discuss them and make them more aware, we hope to achieve that bottom line -- increase readiness through training.

We looked at many, many considerations and in those considerations, what many of us felt was very important is that overall acquisition strategy, which identifies what it is we want to do, how we're going to do it, and then, of course, tied into that is the execution process or the cost control to increase an overall return on investment.

From these considerations, there are many challenges and constraints that we all considered pertained to them, and I have listed here a summary of how Services would view the challenges and constraints associated with improving the overall readiness. As you might suspect, indicated here are the concerns and challenges that we in the Services, in simple terms, are looking to increase our overall return on that investment and to come up with affordable weapon systems, and affordable trainers and simulators in support of those systems.

Similarly, if you were to look at how industry views it, things that become apparent are issues like program instabilities, changes, also business concerns. But again, I think, in fairness

and in looking at industry's concerns, they, too, are looking at that return on investment, and again, looking to come up with an overall effective acquisition strategy associated with trainers and simulators.

From this, after many meetings and deliberations, we came up with what we would call our management panel issues. I have them listed here and what we're going to do in a very few moments is to have members from our panel address specific issues that fall in these categories. What we hope to do is have views from both Services and also from industry, and then open up for questions on each issue. We would prefer, if you have questions, that you put them in writing. It's not necessary; if you prefer, you can also use the microphone.

Let me now turn to our panel. We are pleased to have a very distinguished panel here -- senior members from government and from industry. We have Major General John Oblinger, who is the Director for Development and Engineering from the U.S. Army Development and Readiness Command. We also have Rear Admiral Dunleavy, who is Director of Manpower and Training; Major General Monahan from the Air Force, who is Director, Development and Production, Headquarters, U.S. Air Force; Major General Day, United States Marine Corps, Deputy Chief of Staff for Training. From industry, we have Dr. Caporali, who is Senior Vice President for Technology from Grumman; we have Mr. Kurt Merl from Sperry, who is Vice President with the Electronics Systems; we have Mr. Joe Montalbano, who is Executive Vice President from AAI; and we have Mr. Bill Turner, who is President of Singer-Link.

What I want to do now is ask panel members to address the first issue, which is Concurrent Training Weapon System Development and Responsible for Design Test Data and Weapon System Common Equipment. What I plan to do is follow the following order. We will have Mr. Turner from Singer give a brief presentation. He'll be followed by General Monahan and then followed by Dr. Caporali.

Mr. William Turner

Good morning, ladies and gentlemen. I guess the best place to start is first of all, what is concurrency. Our definition of concurrency would be basically the ability to field a training system that matches the configuration of the prime weapon system at the time it is fielded, remains concurrent with it while meeting the established training requirements. That's a mouthful. I submit that our performance to date hasn't been exemplary. I also submit that as an industry/government team, we indeed have the ability to achieve.

What's it going to take? Essentially, it's going to take a joint commitment, which I don't think has existed to date. Let

me break that commitment into two parts. First, from the Government side. I think we really need to see a government commitment to establish the need for concurrency. Not just lip service, but to dedicate the resources to bring it off. By this I mean the commitment to move to the left on any schedule, by setting training requirements very early in the program, the basic training strategy. You don't have to wait for total system maturity; this can be done at the front end. When this is finished, we need to recognize, then, what the critical path drivers are so that we can begin to manage the acquisition of the training system early on. The critical path drivers historically I think we can focus on are such things as system data, system parts, a basic configuration management system to track these two throughout the acquisition process, and, of course, funding to accomplish what we want to do in terms of a concurrent acquisition.

Essentially, we need to start earlier. When you start early, you have to recognize that there are some risks and there are some costs, but they should be worth it if we can field a concurrent system.

From an industry standpoint, we need to step up and commit and recognize that the training equipment supplier/developer has to establish a close working relationship with the prime developer. We as an industry need to develop quick reaction capability. From an engineering standpoint, we need to consider modular design within our systems to accommodate change, growth provisions, configuration management, and, of course, cost control.

Embedded in this issue is the issue of GFE/CFE. I think anybody who has been experienced in the business well knows whichever way that goes, it's lose/lose. It's not a solution to decide whether it's GFE or CFE. We have to decide whether we want a concurrent system and move the requirement to establish the need for parts and data up front. Then it really doesn't matter. The contractor can buy; the Government can provide. And then it becomes a win/win situation.

I think that's really only an embedded issue and if we can attack the bigger issue, that's the kind of thing that can take care of itself.

In closing, I just couldn't help but think -- I've been around 25 years in this business and concurrency was an issue forever. It's interesting; way back in the F-106 days -- and there are a few old folks out there who remember this, too -- we even had a concurrent clause in our contract where we had the ability to have somebody down in General Dynamics that picked up data on a regular basis. The Government trusted us to make the decision on whether a change was significant for the trainer or not. We actually unilaterally implemented design changes and by the time we reached the Configuration Control Board, we were

there at the same time with General Dynamics with an ECP. Somehow, we've forgotten that. I submit we go back to it.

Major General George L. Monahan, Jr.

Let me take the first part of this question or issue first. It has to do with who is responsible for data, how do you make that thing work, how does the simulator contractor find out what he is supposed to have in terms of data, where does he get it, etc. I think that's the easiest part of the problem. I think that that's one that can be rather easily worked between the simulator SPO and the weapon system SPO, but the important point is that someone has to step up and consciously do it. I think that all too often that's probably where we fall down. It's relatively easy for a weapon system SPO to write the proper contract with that weapon system contractor or the simulator SPO. In the case of the Air Force, the way we break the SPOs apart, they can certainly write the right kind of contract with the simulator contractor, should you be doing it in that kind of a fashion. Through the cooperation, then, that is contractually established between the two contractors, I think that the necessary data can be relatively easily passed.

That's probably the easier part of the problem. The tougher part, of course, is the concurrency. Really, over the period of at least the last ten years in the case of Air Force simulators, there has been a tremendous lack of concurrency. Just about every simulator program we have lags our need, and it lags our need not by a period of months, but in almost all cases, a period of years, such that we either have the original simulator that's too late getting out into the field or the simulator out in the field, as Mr. Turner said, does not match the airplane because of changes that have been made and we've not been able to keep up in the simulator itself.

What are the solutions? Don't know of any magic ones, but there are a couple of things -- first of all, on the Government side it's very easy, when budgets have to be cut, to step up and cut things like training equipment, support equipment, that sort of thing. You don't cut the number of airplanes that you're going to buy -- at least, that's our tendency. And I can tell you, at least in the case of one of our major programs in recent years, that that indeed happened and we ended up with simulators that were late getting out in the field. That's the first part. I think another part that's important is perhaps we've gone overboard a little bit in complexity. Our simulators tend to be very software-intensive. What's that do? I've very recently had some experience with our F-16 program where we made some quick changes to the airplane that we thought were very important to do. We modified about 1,000 airplanes around the world in a period of just a couple of months. When we checked on the simulator to make

sure that it kept up, the first thing I was told was that it would be about 2-1/2 years to do. Why 2-1/2 years? When I dug into it, an awful lot of it was because of the software that had to be re-written, which was a tremendous, substantial amount. We couldn't just go in and rewire or something. So we had an automatic built-in problem. We didn't have to write any software to change the airplane. We had to write a tremendous amount just to be able to go ahead and change the simulator.

Just to sum up, and I think Mr. Turner hit on a couple of excellent points, the first thing you need starting out is a good strategy in any program. I think with a good conscious effort, if somebody will fence the dollars, if somebody will write the proper contracts with the simulator contractor and with the prime weapon system contractor and then get in and manage the program, I think we can indeed do substantially better.

Dr. Renso Caporali

In deference to tired eyes, I'd like to stand up here where the light is a little brighter.

I'm from Grumman and we consider ourselves to be a major systems prime, and I can assure you, as all of you know, that remaining competitive is a primary concern of ours. One of the most important factors used by source selection authorities in selecting a prime is -- and well it should be -- that of past performance. When we introduce weapon systems, the manner in which they are introduced, the success they have in the early deployments, the operational readiness of the fighting forces using our equipment, their ability to use those weapon systems effectively, all are factors which reflect upon us, upon the weapon system and upon the cognizant prime.

We therefore are incentivized to be concerned that when a new weapon system is fielded, that there be personnel ready to utilize and operate that weapon system. Clearly, then, and I don't think there's any disagreement from everything I've heard this morning, we believe that early and effective training in usage of the total weapon system is, in fact, the requirement. As a matter of fact, to have personnel ready and capable to use a weapon system when it is fielded and to use it to its full capacity absolutely must be planned and made to happen, regardless of whether all the desired equipment is in place. I think it goes without saying that to have the requisite trainers available early on would very much ease the task that has to be accomplished.

Concurrency, then -- it's pretty easy to say that we're for it; what's a little more difficult to ascertain is exactly how it is that we bring that about.

Speaking strictly from the prime's point of view, today's system complexities make it mandatory that any prime contractor design and validate via laboratory simulation. As one example, we at Grumman are now working on major improvements to virtually all of our weapon systems and consequently, have running extensive system simulation activities in each of these areas. This puts us early on in a position to assist simulator manufacturers, work with simulator manufacturers, and pass down to simulator manufacturers that information which will ensure that the performance characteristics of simulators match the performance characteristics of the weapon system. We, as primes, in fact, can do more. As an example, onboard computers that are today being designed for the F-14D and A-6F, both proposed updates are being designed to go into the simulator. These types of actions can do a great deal to assure concurrent weapon system deployment and trainer availability.

After initial introduction, of course, the ever present changes must be immediately translated to trainers. Ideally, simulators should match the weapon system deployed at all times and while I do say "ideally," the fact of the matter is today's digital computer capabilities make this possible if preplanned and managed properly.

What about the cost aspect? Concurrency has a real ring to it because it inevitably means errors which impact system procurement costs. I think there's absolutely no question but that they will and would. But how about the total costs of acquiring and operating a system? I believe that the figure right now in the Congressional Record is set at approximately six years for major flight type simulators to pay back the investment, allowing for about a 17 percent a year rate of return. Now, trainers that are delivered some three years late, which is not uncommon, lose the savings that could have been achieved if they had been delivered concurrently. Savings, which is very hard to believe, would more than pay for some of the inevitable changes which concurrency would bring about.

We all know that simulation technology is advanced to the stage where airline pilots are being transitioned to new aircraft via simulators. Very likely, all of us have had a ride in an aircraft where the captain up front had his first ride on that one that we were on. We know that the fidelity of simulation is now at the point that military operators, such as the E-2C radar system operators, find that the only practical way of training is on a simulator. We just can't seem to get any nice fake wars out there to get people attuned to what's going to happen. Trying to accomplish this sort of training without the proper simulators, which is not uncommon, especially early on in the program, constitutes an operating cost that more than pays for concurrency-induced errors.

Now, is concurrency practical? I personally played a role in Grumman's bid for the Navy jet trainer program, the VTX, as did my fellow panel member, Bill Turner of Link-Singer. That program, as an emerging system for the U.S. Navy, was looked at in its totality right in the beginning. It was to include the aircraft -- does include the aircraft -- the training systems, and the syllabus that would be required both for flight crew and maintenance personnel. Bidding required analysis of the entire pilot training process, and the various aircraft primes did the whole program with simulator houses as team members. In that case, contractual arrangements were made early on between the primes and the various simulators manufacturers for data and weapon system common equipment. At least in that one case, some level of concurrency was believed to be practical.

Another example involves simulators of major upgrades. As I mentioned earlier, we do have major upgrades underway for the F-14 and A-6, and are today working with the various simulator manufacturers who had previously built the trainers supporting these weapon systems. In the laboratories today, where our engineers are working with dynamic simulators to analyze the major upgrades, is where we will be concentrating our early training design efforts. Our training systems engineers are working with our weapon systems engineering organizations for the purpose of designing those systems, software and hardware, that someday will find its way into the simulators, be the common element between the flying system and the simulator.

In summary, it is Grumman's feeling that concurrency is highly desirable and that to achieve it the prime contractor and the various simulator manufacturers must work together right from the beginning. We must drive toward the goal that when the aircraft or the weapon system is ready, the simulator is ready. Further, we believe that this can best be achieved, from the Government's point of view, by structuring programs as was done by the Navy with the VTX, with one overall system prime.

General Pellegrini

Do we have any questions?

Question

I'd like to make a comment on what General Monahan mentioned about fencing money. Until we, the military, and we, the industry, and we, the Congress, start sitting down and putting our heads together and fencing money for training, we're going to lose the ballgame because every time we, the military come up with a requirement -- and I'm talking primarily about aviation -- and when it comes down to the budget crunch, the first thing that falls out is training. We end up buying through influences from industry --

maybe it's spoken word or slight innuendo -- or Congressional effort because it doesn't happen to be in my particular district, the aircraft wins and the trainer falls out. Until we as the military/industrial complex get our act together and start working as a team, everything we're hearing is almost like water over a dam. We have to have a philosophical change of where training is going to stand in the operational forces. I know I'm preaching to the choir, but we keep dancing around it and we never address it.

General Pellegrini

Thank you. Our next issue pertains to acquiring supporting training systems through weapon system prime contractor. To discuss this issue, we are going to have four presentations. We'll start with Admiral Dunleavy, followed by Dr. Caporali, then General Oblinger, and then Mr. Turner.

Rear Admiral Richard M. Dunleavy

Let me preface my remarks by identifying my institutional point of view. While I am the Navy representative, my experience and responsibility lies in naval aviation, a major Navy user of training devices and equipments. My observations, while made from the perspective of naval air, are, I believe, of general applicability. There is a lot of parochialism in what I'm going to say. They're my own personal opinions and they're going to aggravate some of you out there, but I think this is a forum and we want to lay things out, free give and take, back and forth, on how we, the military/industrial complex, can get a better product to the Fleet and to the user in the quickest way possible at a reasonable cost.

The issue is the advisability of acquiring supporting training systems through the weapon system prime, and more specifically, under the basic weapon system contract or through breakout contracts. While our subject addresses acquisition and support training systems, I have the impression that the principal interest is in training devices and equipment, which are subsets -- both certainly key ones -- of the overall training system. My comment will in the main reflect this focus. We have to give the thrust to the overall system. You heard Cap mention the VTX. That was our Navy's first real thrust at a total system.

The first consideration is that dedicated trainers are not stand-alone end items with their own mission priorities. They are, instead, integral elements of the operational system supported. Timely achievement and continuing maintenance of weapon mission readiness and capability are the over-riding objectives and the drivers of priorities. Within the framework of governing directives, the decision whether to acquire trainers through the weapon system prime contracts or through breakout contracts

ultimately rests, then, on which is most likely to provide the best weapon system need. Greater safety and total operation capability during introduction and early operation of aviation weapon systems are critically dependent upon a suit of high fidelity, properly configured trainers which cover a wide spectrum of system characteristics and functional and mission applications. To meet this requirement, trainers obviously have to be available and effective. The question then becomes what method of acquisition is likely to give us the best trainers, the soonest, at reasonable costs.

Competition -- a widely concerned voice with respect to buy through the prime is the effect on competition. Competition is directing policy. The question is legitimate and can be answered. Acquiring trainers through the prime does not eliminate or even diminish competition. First, the prime contractor itself is competing at the first tier. With appropriate contractual provisions, we can make the prime responsible for the trainer suit and require him to maximize the competition at the second tier. This gives us the leverage -- the whole weapon system acquisition -- to ensure fair and credible treatment of the trainers. Further, this leverage is available to us not only in winning proposals but throughout the entire contract evolution. Buying through the prime does not put anyone out of business in the training acquisition game. It just changes the dealer.

The data selection, weapon system technical data, common components, and engineering coordination have, in all recent experience, posed one of the most formidable obstacles in timely development and delivery of high fidelity trainers. While weapon system data and common equipment are only part of the overall input to trainer make-up and development, they are invariably key pacing items which, without the development, cannot proceed and timely availability is forfeited.

I think it is safe to say that breakout trainer acquisition as has been practiced before has not worked too well. The approach mentioned earlier to this problem for the Government to interject itself into the weapon system prime trainer manufacturing loop has serious drawbacks which can be brushed aside in planning, but can become all too obvious in the implementation. I'm a member of government and have 28 years in the business, most of it in the Fleet, but any time we in government start to get involved in industry and start running around industry -- if ladies weren't present I'd tell you my real observation of that, but we sure muddy the waters a lot when we start telling industry how to do things.

You are the industrialists. You guys know how to run business. Run it and keep us out of it. We should set the requirement, tell you what we need, and you provide. But when we start getting involved, in my own personal opinion, we sure can screw things up.

The costs -- assuming that buying first article trainers through the weapon system prime is the best way to address the parent system trainer coordination problem, the question of cost immediately arises. There is little question that somewhat higher up-front investment cost is required. Something like a one-third increase is a typical estimate. This is not just extra management and overhead burden, nor is it in reality an increase in the ultimate total acquisition cost. But we can invest early and over the life cycle cost, reap the benefits of that early investment. I'm talking about seeing a whole program through its 20-25 year fruition; if we put the money up front, get the trainer on the line when the aircraft or ship arrives in the Fleet, we have a good product at a good cost.

The prime expertise and attitude -- do weapon primes have special knowledge or expertise necessary for the overall oversight of trainer and training system development? And are their priorities and interests compatible with training needs? I'll let the prime speak for that, but I'll give you my own personal opinion. Most primes build engineering simulators and some have built complex operator trainers, as well. Our subject is the acquisition of training systems and not training devices. Historically, primes have been involved in training -- they train their own people to operate the gear they sell to the military. They provide factory training to our maintenance types of flight crews any time they operate a system. So the primes are involved. They also develop and deliver significant elements in the training system. With all this behind you, you must start, in my estimation, on an equal footing with the training industry. Quality and timeliness of these trainers compare favorably with those contracted separately. Historically, if I look back at my 28 years in the Navy, some of our most successful programs have been through a prime. My personal experience in the A-5A, the A-3G-1, North American -- the trainer was on line when the aircraft was introduced in the Fleet. The A-6 also did well. As a matter of attitude and interest, I submit there is nothing like a key provision in the major RFP, Request for Proposal, to generate positive attitudes and keen interest. The bottom line is we have to get our house together to better order in training system utilization acquisition. This is plainly attested by the number and variety of agenda items before this conference. Training system acquisition through the prime, in my judgment, is one feasible and constructive option in our efforts toward improved management and operations at sea.

Dr. Caporali

I get the feeling the best thing I could do is pass after that one and let the good Admiral get picked on.

Generally speaking, todays weapon systems are very complex, so much so that the number of companies, government agencies, and people responsible as opposed to those involved really have to be

limited. It's almost impossible to acquaint all of the subtier companies, agencies, and people who participate in a step-down fashion with the overall designs and capabilities of the various weapon systems. To acquaint on a timely, continuing basis various levels of government personnel with the evolving designs so that they can then translate these designs into contractual simulation system specifications to be passed down through a variety of simulator manufacturers is a time-consuming and costly undertaking. The prime, by taking an active and responsible role with simulator industry, can directly produce timely and accurate representation of weapon systems and update them as required with a minimum of cost and delay.

The evolution of complex weapon systems has resulted in prime contractors, as the Admiral said, being staffed not only with individuals that are practiced in the various disciplines and the various vehicle and avionic disciplines, but in fact, with simulation engineers, as well. Prime contractors today must and do have dynamic simulations in their laboratories in order to develop improved design concepts. Prior to production release, todays systems are integrated, bread-boarded, bench tested, validated. But is it possible to scope the size or complexity of the simulator during this development phase? Actually, for emerging weapon systems, instructional design work should be performed as part of the design process. This can put a fence around the scope of the simulator and training requirements, thereby letting the process start. Even with a current system, or what is normally the current system, we all know that the trainer and simulator planners budget numbers years before a simulator is actually quoted. Our ability to keep secrets is so great that the process produces bids amazingly close to the budget dollars available. Surely, a redirection of all this talent could allow the formal training process to begin officially very early in the program cycle.

I mentioned earlier that in our laboratories, systems are evolving for the F-14D and A-6F aircraft, which have as goals a high degree of commonality between those two aircraft. People on the senior management level are responsible for ensuring that they carry the maximum amount of common equipment. This commonality extends to the trainer world. Our senior vice president responsible for our military aircraft programs at Grumman is also responsible for Bill Eager's training systems program operation. We intend that our training systems organization be in sync with the weapon systems design and development activity right from the beginning.

We believe it is fair to say that our training system organization is dedicated to the success of all Grumman product trainers independent of origin of manufacture. We believe all primes could be expected to be similarly responsible. Accordingly, prime contractors who are most knowledgeable of their weapon systems should be tasked to perform detailed training analyses early in the design stage of a program, and early recommendation should be required as

to what part task trainers, operational flight trainers, what system trainers would be needed. During this early phase of the program, the weapon system and training system should emerge together under the riggers of a formal DOT configuration management system.

Use of the weapon system computer in the design of a simulator can do amazing things to tie together the configuration of the weapon system and the configuration of its trainer counterpart. Todays users are very critical of simulators which do not accurately represent the deployed configuration of the weapon system, as well they should be.

As for the management aspects, government agencies in general that are involved with the simulation today are not adequately staffed to act as system integrators. Prime contractors with knowledgeable personnel can manage and pass on as a contracted task that data and information required to produce accurate and timely simulators. We feel that the resultant high fidelity training equipment, available concurrently with the weapon system, would result in savings to the Government far in excess of the profit that would be earned by a prime contractor for managing simulator procurements.

In summary, I'd like to say that the prime interested in its weapon system should play an active role in training and simulator activities right from the beginning. The prime does not have to build the simulator, but simulation is a technology which primes must possess in order to design, validate, and modify, and therefore, it is a capability that can be used to manage simulator suppliers. We believe total system integration by one prime is the way to go.

Major General John B. Oblinger, Jr.

My opening statement is designed to provoke some discussion. Hopefully, I can step aside and let my colleagues answer the questions. I can see that sides have begun to emerge over this issue. Amazingly, being the third speaker, all my points have not been covered, so I'll start.

The training device community has expended great quantities of blood, sweat, and tears trying to develop training devices in sync with new weapon systems with continuing problems in delivering the correct and current data, GFE, and parts support to an independent device contractor when the apparent, easiest way to solve the problem is to make the training devices a line item of the prime system contract. After all, the prime contractor owns the data, is already charged with procuring or producing weapon system common equipment, and has the responsibility for maintaining the configuration management of the prime system.

Why have we resisted this apparently simple approach for so long? It's not really because the training device people at PM TRADE and NTEC and SIMSPO are jealously guarding a rice bowl. Does it matter if the prime contractor isn't in the training business? He already coordinates the effort of many subcontractors. Will one or more contractors, subcontractors make a big difference in his scheme?

The following are some, I believe, justifiable arguments for separate development. Some of the primes may be lacking in the following: training expertise; unique material developer expertise; knowledge of simulation technology; emphasis on the training system; willingness to maintain funds and their good personnel in the training device section of the contract. On the other hand, the training device contractor can emphasize more concern with the device schedules as opposed to the prime system schedules; his ability to cater to a different user, especially when talking about trainers to be used in an institution rather than the field at large; and unique support requirements.

So any of the above are of sufficient magnitude to warrant expending extra effort for independent device development, and they certainly can be a reason for doing so. So to simply say that to go with the prime contractor is the easiest way just may not be the solution.

Mr. William D. Turner

I'm not going to take this sitting down this time. Believe it or not, Cappy and I are good friends and I really thought I was going to be one out of four -- thank you, General, for coming to our forefront.

Actually, as one of those crazy guys in the independent part of the industry, I'm a little surprised when I heard this was the number two issue. This was a major issue back in the 60s and early 70s, and there was a great deal of thrashing around. As a matter of fact, there are some items in the Congressional Record that indicate that the simulator industry should be considered as a prime contractor on things like F-15 simulators and so forth. So it came as a shock and I volunteered to address a shock.

Really, in our business, the market satisfies requirements. Industry responds to requirements. All you need to do is look at this conference and you can recognize what has happened. The Services have indicated they have a need for training systems and industry has responded, and every year we keep responding and getting larger and the technology has just raced ahead of us. Also interestingly enough, the Government has formed its procurement and acquisition and requirements teams to get what they want. It would be an interesting conference if everything was bought through the

prime, as directed early on. I wonder who would be in the audience here today. It might be sort of boring.

My point is let's solve the problem in the most expeditious fashion. Let's let the competitive environment do it. Really, history has not shown that going through the prime is the golden answer. I think it's fair to say that in some cases, going through the prime route has shortstopped the basic competitive process. Make or buy decisions can get arbitrarily made even with the best intentions of the Government agencies. It certainly, in my recollection, hasn't solved issue one that we talked about today -- concurrency. That's a basic problem that we all face and just organizing doesn't solve that. It's like attacking a tough technical problem by reorganizing engineering.

It certainly lengthens and filters a very important interface and that's the training system developer and the user. We build equipments that are qualitative in nature and not necessarily quantitative and we have to have that interface to be able to meet our requirements. I submit that an added layer certainly has the potential of increasing costs. But very interesting, I really don't see where the primes can maintain the technical cadre of management and engineering people to support a high technology industry like ourselves and really do it justice.

I'll leave one thought. At least our history shows that in a simulator development only 30 percent of the basic effort really associates itself with those areas of expertise that the prime contractor has; that is, the prime system. The other 70 percent is in a technological field that is very broad and very unique when you think of visual systems, visual data base generation, motion, the basic instructional system and the ability to customize a piece of equipment to satisfy the qualitative requirements of the using community. I think it would be a travesty to force American industry to hold a like technical capability at the management level when it exists right now in the structure that we see in this room.

General Pellegrini

I have a number of questions here. The first one is to everyone on the panel. The question is can you cite examples of when contracting with the prime worked well?

Admiral Dunleavy

The F-14A worked pretty well. The A-5 prime was North American, I believe -- that was almost 20 years ago -- that was on time on the line. The second trainer, the A-3J, that was Don Sanford, was also on the line three months early. This is 1962 that I'm talking about and at that time it was a damn fine trainer. The airplane was ahead of its time and the trainer was ahead of its time in the way of simulation and actually having the airplane

feel like you were flying, and the weapon system -- I was the guy in the back, the bombadier-navigator. It was an exceptionally high tech trainer in that time. The other aircraft that comes to mind -- the F-14A came along in good shape, but then we went too far in the complexities addressed before. We couldn't upgrade the simulator as fast as we could upgrade the aircraft. So the thrust of my speech was that prime was the way to go, but that is not the panacea. I tossed it out for argument's sake. I can see applications over the other side of the bulkhead, the wall, where the prime would not be the way to go. That fellow from Pasadena, California, who has the M-16 shooting with a kick-back -- that guy's a prime to me. He's not an aircraft manufacturer. There are a lot of ways to work it. What I'm trying to stimulate is we, together as a team, to work for the best possible product through Congress at the best dollar.

Question

I'm Howard Ellsworth. I represent Dr. Richard DeLauer's staff and I have two companions with me. We believe as you do that the right trainer at the right price at the right place at the right time is mandatory. We've looked at the training equipment policies of the three military departments and I think they're excellent. Dr. DeLauer's more significant accomplishment is to decentralize to the lowest working level the responsibilities of the military departments. Because of the problems that you discussed this morning, I plan to ask AIA if they could identify specific problem areas and the recommended areas and levels of management that solutions ought to be forthcoming. I plan, also, to turn in a report to . . . who is my immediate supervisor in the acquisition management side that the Secretary of Defense guidance document, the POMs, the PDMs, and the APDMs maybe need to say something a little bit more in the area of teaching machines as they contribute to the cost savings and improved combat effectiveness of our forthcoming weapon systems. My question is, will somebody help me to identify what the role of the OSD staff should or should not be in facing up to some of the problem areas that you're going to identify throughout the conference. Since this is a management forum, I thought I'd lay it on the line to you right now.

General Pellegrini

Thank you, sir. Thank you for the question -- I think. Anyone care to answer that?

Admiral Dunleavy

What I ask is that the OSD staff listen to us, the operators, and our requirements. Hear and listen at the same time. A lot of times we go down and brief, and it's like, to be very honest with you, briefing to a stone wall because we walk out and we know we

lost the ballgame. You asked and question and I gave you an answer. That's my personal opinion. It's tough at times, but other times we go down there and it's like, "I'm glad you came down, here's what we want to do," and we march straight forward. Again, what I'm trying to stimulate is a team effort: we, the military, you, the Secretariat, Congress, and industry getting the best thing possible. There has to be a good profit, a reasonable profit, a just profit. There has to be a good product for us that works in the Fleet. That's all I ask for.

Panel Member

I have one other suggestion that I might make that sort of pre-empts some of what we'll be talking about later, but I think that the training system ought to be defined. And I talk about the system in its entirety -- the academics, the equipment. Initially, in DSARC I and finally in DSARC II, defined in its totality, both as to requirements and as to costs.

Question

Let me ask a clarification on that. Should that be discussed at DSARC I as a part of the agenda?

Panel Member

Yes, absolutely.

Question

Would you put that in 5000.1 and 2?

General Pellegrini

Let me just point out, they are in 5000.1 right now. In fact, when you have a justification for a major new start, you are required at the initial start of that program to identify the acquisition strategy, which, in fact, takes in all aspects of it, to include trainers and simulators.

Panel Member

I really wanted to answer the question before that, but I'll take this one on now, just for the moment. Number one, I think you can help us in the area of keeping the money fenced -- helping to get it, to begin with; number two, to help keep it fenced. Next thing, I liked what you had to say about the decentralized management because I think all three Services have some very unique training situations, very unique equipments, and if there's one thing about the entire training equipment area that I think is an important aspect, it's that you have to very carefully tailor what

the training equipment is to whatever the situation is. The training equipment required to teach a certain task may be anywhere from a complete airplane down to something like a piece of chalk and a blackboard, or somewhere inbetween. So I think that a tremendous amount of tailoring ought to go on. So I like that idea about the decentralized management.

General Pellegrini

This is another question for any member. Let me read it. It seems that long-term leasing of trainers may potentially save the Government considerable money. Documentation, spare parts, and so on may cost less. The industry could benefit by being able to depreciate the trainer over a period of years. What are the prospects for long-term leasing in the future?

Admiral Dunleavy

I don't like it. Why don't I like it? Because if you ever change you mind and you want to do business with me, I don't have a trainer left. That's basically it. I do not like leasing because I want to own it. If you walk out the door, I have to figure out some way to work it and train the guys. Again, that's a quick shot, but when you start talking leasing of military equipment, I, as a professional military, get very goosey. I want to own it and run it and operate it. That's my job.

General Oblinger

I'm going to step in. I've got answers to the third and second questions back. It took me a while through my notes to the third question back, which was is there any evidence that a prime has developed a satisfactory training system. One of the reasons I was a little bit slow, my researchers said for the Army that the Firefinder system, that training device was successfully done and fielded. I think the attributable reason to that is that the prime has a major division that is a training simulator division.

A comment to how can you help -- and I'm not sure whether you're the one to do it -- but I perceive a sort of chicken and egg problem that we have. Ammunition of all types is expensive and also there have been studies done by the departments and industry folks that show how much cost savings the Services can get from training devices, and yet it's difficult to get off the ammunition side and get that seed money because the devices are expensive up front, too. But the life cycle savings are great. But we don't seem, in our great way of compartmenting money, to be able to get off one and over onto the other.

General Pellegrini

Bill, do you want to add something? Bill Krakaw from DARCOM.

Mr. Krakaw

I think this dream of fencing -- everybody is smoking weed if you think you're going to get something fenced. So to talk about it is just nothing. The idea is not to fence, but to get a little smarter about what you're selling to Congress, and we're not doing it. I know the Army gets up there and says they need the thing and they're going to save all this ammo, and the guy says, "Well, can I take it out of your ammo budget?" The answer is, "Oh, no, you don't understand. We're now going to use that same thing or more for something else." The day that we show them that we're saving -- really saving -- something, they'll give you money. That's what they're waiting for. But we go up there and keep snowing them and it never works and then we wonder why we don't make it. We've got to get smarter and there are ways to get smarter.

General Pellegrini

While we still have the second issue up, I'm going to take one more question that I have here which hopefully may capture some of the concerns, and although it is directed to Admiral Dunleavy and Dr. Caporali -- let me read it and if I could ask them to have a short response, then I'll move on to the next issue. Here's the question -- all primes aspire to or are actually designing and manufacturing training devices and simulators. Given this, how can primes be expected to talk openly to training device suppliers when they view them as competitors?

Dr. Caporali

I'll have a try at that. It obviously becomes very much a function of how a program is structured, but let's presume for a minute that what we're talking about is putting the simulator right up front so that when the prime competes, he competes for the whole smash -- the whole weapon system, the simulator, everything that's associated with it. As a prime, when you're going after a major weapon system -- and there are frightfully few of them coming down the road these days and they're spaced pretty far apart -- you're interested in the whole banana, not a piece of it. Now, as important as simulators and trainers may be, fractionally they represent a fairly small proportion of the overall program. It's inconceivable to me that any prime will do anything to jeopardize getting the whole program, and that will include, obviously, putting together precisely the best team that they feel can be put together to win the overall job. Now, as long as the simulator industry does their own homework and remains best in their own field, they have absolutely nothing to fear. If those sound like a lot of high-sounding words, let me tell you right now that that's precisely what we went through when we lined up the team for the VTX. We had a trainer system, and we had a trainer system within our corporation that would have been perfectly

capable of being our trainer house. But in the judgment of those that had to make the decision as to what it took to win the whole program -- which, of course, we didn't win anyhow -- we decided that the best team could be fielded by getting a trainer house with us and we teamed up with Link-Singer. I can't imagine that it would ever come out any other way. The best insurance, frankly, that the prime would be straight with you and would allow you people on the team is that each and every one of you strive to be the best in your business. I might add that if you don't do that, you deserve to have your lunch eaten by someone else.

Admiral Dunleavy

Those are tough words. You can see I'm a military guy and I look at a prime contract as I look at a C.O. of a ship. If a ship is in trouble, a squadron is in trouble, I look for the C.O. and I want an answer out of him -- not the chief engineer, not the operations officer, but the C.O. to answer to me how come things are going right or how come things are going wrong. And when I say prime, I mean an individual who is going to take the entire system, put it together, and give me a product. If it's a training device or simulator, I want a Bureau number on it. So I'm buying a total package and the trainer is a line item in the budget just like the airplane is, or the ship or whatever it may be that we're buying. Now, the prime, if he's smart, is going to get a very smart, competitive training simulator manufacturer as a team member, as Cap mentioned in the VTX program. But then again, millions of guys in the Pentagon -- I'm not going to go to the guy who is manufacturing the training simulator, I'm going to go to the prime and ask how come the training simulator is not meeting my specs, prime? If we write the job right in the RFP, we can force that. This again is the team effort I'm talking about of the military, the Secretariat, the industry, and Congress doing our job and working together. I think the comment from the young fellow about fencing is a valid comment. We have to work in order to get the thrust through, to get the best possible product for we, the military, and we, the American people. I'm preaching to the choir.

Mr. Turner

I can't go any longer. Cap, I'm glad to see you get Singer-Link on your team because I realize that you needed a good one.

General Pellegrini

When did I lose control of this panel?

Mr. Turner

I think the issue becomes one, as the Admiral has said, of teamwork. We want a trainer and it has to be cost effective.

Someone spoke earlier of the F-14, and although we weren't directly involved in the F-14, I believe at that time the Navy paid the prime aircraft manufacturer perhaps on the order of four to five times what the going rate at that time from a simulator prime might have been for a comparable system. So I think that that is one of the key issues. Not only do we have the technical expertise in the industry for training systems -- not for the aircraft -- but we do it economically. And I think that is the big reason why it should not go to the prime.

General Pellegrini

Thank you. I know we could continue discussing this, but let's move on. Our next issue is going to be addressed by Mr. Merl from Sperry and General Monahan, and as you can see, the issue pertains to testing -- how much subjectivity and reasonableness.

Mr. Kurt Merl

The issue of acceptance testing is just another part of the discussion on concurrency. When you have a well-developed system and you know exactly what it is that you want to buy, the preparation of the acceptance test procedures and the methods of testing are relatively straightforward and don't become a serious problem.

The place where they become a serious problem and an issue of considerable controversy is when you reach the issue of concurrency. Now, the best that I can hope to do is to try to address the issue of acceptance testing by defining some areas by means of which we in industry and the Government can work better together in achieving the objectives that we both have, which is to get a training system out into the field. So I'll hit that with four specific recommendations.

The first is to do more advance preparation and planning for acceptance testing. The second is to develop, as best we can together, more objective and especially more quantifiable measures of training equipment and simulator effectiveness. The third deals with tailoring acceptance test procedures and standards to the system being developed and to the quality and the timeliness of the data available. What I mean is, in what portion of the life cycle that you're trying to accept the system in relation to the prime system. Finally, teamwork with and between industry and government. I'm going to come back and address these on an individual basis.

First of all, advance preparation and planning for acceptance testing. Like I said before, the ideal situation is the one where you sign a contract and the acceptance test procedures are identified at T=0. The most that we can hope for collectively in this area is that we in fact, together in industry and government,

attack the preparation of the test procedures early in the program. All to often, what we do collectively, between ourselves in industry and the Government, is that a contractor prepares a test procedure in a vacuum, it is submitted to the Government for acceptance somewhere downstream, it then becomes the object of a cycle and recycle and recycle, until finally something is developed that is a usable product. We think that involving the Government engineers and the operational user early in the cycle would help alleviate the problem. That's one.

The second deals with the development of more objective and quantifiable measures of training equipment and simulators. Here you really have to start to break the problem apart into what kind of simulation and training equipment we're talking about. If we're talking about a gun simulator, I think that it is quite reasonable and expected that you would have quantifiable measures for testing and for accepting the system. The place where things become very difficult is in the world of operational flight trainers and weapon system trainers for aircraft. Here, the famous word is fidelity. We always see that in our specifications -- fidelity. And that's where the process of acceptance testing becomes one of sending the pilots in to determine that the simulator flies like the actual aircraft. Now, we don't know a way of getting around that problem either. It is expected and it is reasonable. The thing that does become a serious situation is when the pilot crew is a variable and you have one, a second, and a third. There is no unanimity of opinion as to what is acceptable and so you work the problem several different ways, and of course, you spend both time and money and when you talk about concurrency, that's one of the contributing elements. The problem becomes especially aggravated if the pilot himself has got a limited amount of time because the operational aircraft itself is in its infancy. Perhaps one proposal that would help some is to separate the problem out into two parts -- the quantifiable parts, like you have to achieve certain dynamics, certain slue rates, and we quantify those and we test to those with specific numbers and get those out of the way and make those the first set of acceptance tests that are passed; then a second set, which is held with one pilot crew with a specific limited time to solve the so-called fidelity problem part of the testing.

The third recommendation is try to tailor the acceptance test procedures and standards to the system being developed and to the timeliness of the data available. Now, this, to me, is best summarized by dividing the problem up into an initial problem and the so-called P^3I problem. It is best solved by deciding early that we're going to recognize that initially the simulator will be accepted with the best set of data that's available at that time, with initial recommendations and initial plans for P^3I additions with final acceptance occurring first with the initial set of test procedures and finally, then, followed with the P^3I program to obtain the final results.

The last point, I guess, deals with teamwork and that's probably the hardest problem and yet the easiest to solve. If you've got a team working the problem together, generally people get together and solve the problem in the best interests of the Government. If you've got an adversarial relationship, no matter what you write down, no matter what set of test procedures you have, no matter what plans you set out at the early part of the program, no matter what plans anybody sets forth, no matter what the specs say, there's going to be a problem. Things are going to be late and there's an overall bad situation. I think we've all had experiences in both directions. When the teamwork exists, usually the problem gets solved.

General Monahan

Testing is a problem no matter what the weapon system is, whether it's an airplane, a rifle, or whatever. But I think when you get into the simulator arena you have a problem that is really somewhat unique. It's fairly easy for us to go out and say, well, this airplane should be able to accelerate so fast, it should be able to climb so high, and it ought to be able to pull so many Gs -- do those kinds of things and they get relatively easy to measure. Now you have to go out and say, did that simulator, when I pulled back so much on the stick and I thought I gave it so much in the way of back pressure, did I indeed really pull as many Gs as I thought I was supposed to be pulling when that happened. Then the pilot has the uncomfortable feeling that if that's not really the case, now what I'm doing is being trained in the simulator and my training all of a sudden is counterproductive. So how do you test to find out whether or not the simulator does that one key critical thing, and that is it has to be a good, faithful simulation of what's actually occurring in the weapon system. Fidelity becomes all-important and a very difficult thing to get at.

I think the best way there is to go right back to the principles we follow in the testing of just about any other item of equipment. First of you, you have to lay out and do it between the contractor and the Government team just what your critical test objectives are. From there, you further expand that. That tells you what it is you're going to look at. Then you have to come to an agreement on just what the test plan is and that really lays out how you're going to go about the testing.

Those are two items that, from my experience, have been neglected in the early stages of doing the effort, but is something that critically needs to be done and needs to be done very early on.

Even after you've done that, though, you're still going to get into an area of subjectivity and I don't think there's any real quick and easy solution. We're thinking of a couple of things in the Air Force. For example, one of them is use of what we call auto drivers. Instead of having a pilot up there -- and every pilot is different and every one is going to sit in the cockpit and give you a different evaluation of the faithfulness of the reproduction -- to use either electrical or mechanical stimuli that are indeed calibrated and see if you get the proper response. That's one way to try to get some of the subjectivity out of the testing effort. The other is through the use of a master crew. By that I mean keep the same fellows in that simulator test program that you started with and use them all the way through it. That indeed may take a tremendous amount of their time, but nevertheless, they are the ones that are the best calibrated of the people that we could find.

Let me just close on one final thought. One reason I think why perhaps it's even a major issue here with this particular group, first of all, I think the risk to the customer in accepting the system is adversely proportional to the amount of testing that went on, whereas on the other hand, on the part of the contractor, the risk to the contractor is directly proportional to the amount of testing that went on.

General Pelligrini

This is a question for everyone. Is the testing issue in regard to technical standards or training program effectiveness? If it is training program effectiveness, is it determined by combat effectiveness skills and so on?

The answer to that is yes! Does anyone care to answer that question? If not, I'll move on to the next issue.

The next issue is training system support and maintenance, and to address this issue we have General Day from the Marine Corps and Mr. Montalbano from AAI.

Major General James L. Day

The training system support and maintenance is probably one of the most important aspects of our force multiplier, which is training. At least, we feel that in the Marine Corps and we feel that it's something that we've been building up toward and we've been enforcing what we have published on it in our procedures, and we're down the road pretty well on it.

Reliability and availability are two of the elements and they are essential to making training devices effective. They, combined with maintainability, must be built into the training devices. Many times in the past this has not happened and we've had some horrendous

results as a by-product of not being able to build maintainability in with reliability and availability.

The integrated logistics system, which is the second aspect of the program, is well down the road. We in the Marine Corps have been striving to get this probably at the forefront from six or eight years, and we're satisfied with our progress on it right now. It is an important aspect within the multiplier, and one that we intend to continue to pursue.

The one area that we probably have the biggest problem in is in the field environment versus the commercial environment -- what do we build into this and how do we build in the specifications toward that. This is where we've had some of our horrendous failures. When we take something that we've built for the field environment and tried to link it up with the commercial specifications. In most cases, it doesn't work. In some cases, it does, but in 90 percent of the cases plus, we don't have success in that area. If it's built for the field environment, then we're going to have to establish certain military specifications and they're going to have to be appropriate. We know that in the past we've been very weak on building in these, or expressing or articulating our needs in that area to you, and we're cleaning up our act on that and we think we're doing fairly well on it. But this is an area where we're going to have to get feedback from you. I would like to buttress Admiral Dunleavy's comments that we know that you make dollars by selling a product and we know that you have to build that product for the Service to get it to us, and we shouldn't tell you how to build it. We've done that so many times in the past that we've asked for excessive documentation. We've put military-hardened requirements on your backs, primarily because it comes down to us to do it. But we've observed over the past many, many years that this probably is an area that we're going to have to take another look at and I think you have us on your side. We're trying to find out a way that we might be able to ameliorate some of the constraints where they don't hit you all at once and where it can make it a little bit easier for you to come up with a product that in turn is one that, in the final analysis, helps us.

Due to a high turnover of military personnel in support centers and contract maintenance and a turnkey operation, we might be more effective; however, contracting must be within the current guidelines that are set down to us by the Secretary of the Navy and the DOD. It means that that simulator must be competitively bid and we feel that everyone knows this, but there are still times when that point comes up where we're not quite sure that we're getting the information out to you. But we think that in order to make that force multiplier work, that the aspect of training system and support maintenance must be considered in the forefront of all of our planning.

Mr. Joseph E. Montalbano

A recent trend by the DOD to consider contractual support for training systems has raised many questions, many old topics. That is, availability, reliability, commercial standards versus military specifications, and organic versus contractor support. The operational commands and the acquisition commands are, in many cases, of opposite opinion about each of these areas. The term availability has recently become the word used to measure or quantify the training effectiveness. This may be an inaccurate interpretation or at least somewhat misleading. The word availability really means that the device is available to perform its designed tasks. The degree of availability of a device for training is highly dependent upon the quality of its support package, which includes the qualified support personnel, the right types and quantities of spares and test equipment, and the data package that has been tailored specifically to the support system that has been selected.

When availability is defined in a contract as a support maintenance criteria, reliability then becomes a subset or element of the criteria. Then the reliability requirements are of questionable value because a low reliability system can achieve a high availability rate if the support package is of high quality. How much is the Government willing to spend on reliability to achieve a high availability rate? Higher support cost is indigenous to higher availability. The opposite is normally true in a high reliability system. The question then becomes are the costs really worth the benefits?

Another subject that creates dischord within the DOD community is the topic of commercial standards versus military specifications. Considering the benign environment in which many training simulator systems are housed, the military specifications -- is it a realistic requirement? Do they provide any true benefits in such an environment when compared to the current quality of commercial standards? The stringent military specifications drive the acquisition and support costs up and also reduce component and piece part availability. We know that if the proper use of commercial parts can be specified, tremendous economies can be saved. So the costs really have to be traded off against the benefits.

Finally, should the support for the training system be organic or contractor furnished? Several cases can be cited in favor of contractor support, whereby the Government realized considerable savings and increased availability when the support concept was changed from organic to contractor. One of the obvious advantages of contractor furnished support over organic is the deletion of requirements for the maintenance training programs. The Government owned and contractor managed approach to managing spares and

support equipment relieves the Government of the burden of such indirect costs as warehousing and inventory control. There was a recent article in this past month's Nation's Business, talking about warehousing. A company replaced government warehousing and distribution of aeronautical and nautical charts. I believe the organization is NOAA, and the average cost for the Federal was $2.8 million per year; the cost of the commercial company was $1 million, so that was a saving of $1.8 million. That's not related to our industry, but it does talk specifically about the warehousing and distribution.

Several other cost savings advantages can be cited, but in each case the premise is that the contractor support is more economical and effective than the organic support.

General Pellegrini

Thank you.

Before we move to the next issue, Joe, I'd like to ask you a question. You just raised, I think, some very important points and if I got them correctly, the issue of contractor versus government support; commercial versus stringent military standards; and RAM considerations versus life cycle costs. Do you see us in government moving in the right direction as viewed from your vantage point or are we still tending to take the wrong course of action?

Mr. Montalbano

I think what's happening is that there's still a lot of fence riding. Remember that there are two groups that are on different positions. One part of the acquisition side of the house will be pushing for the contractor support, but the user group is going to fight that. There is a tendency to resist it. I think the direction toward contractor support is the right way to go.

General Pellegrini

Does anybody from the military want to comment on that? Do you all agree?

Admiral Dunleavy

We in the Navy have gone almost universally . . . and simulators and it's working exceptionally well. We're pleased with it.

General Pellegrini

Here's a question for the military. Can the Services provide for contractors their plans for contractor support of simulators, i.e., the four- to five-year plan by device?

Is that a non-question? Let me ask a related question to that. It seems to me when the Service puts together an acquisition strategy for a weapon system, embraced in that acquisition strategy are such things as simulators and trainers and whether you plan or do not plan to have contractor support. As we indicated earlier, that is a requirement in 5000.1. It's something that is reviewed at the Major Milestones on SARCs and I would think that the Services have those four systems and they are addressed at all milestones. Does anyone from the panel want to reinforce that?

Admiral Dunleavy

I think I'll go back to the fence sitting comment. Yes, and the Navy was fence sitting by the user in the sense that we in the Navy are somewhat unique because we go to sea and we can't keep people at sea for 20 or 30 years, even though some guys would like to. Some guys have to have some home life, so we rotate them ashore every three or four years, and we have to have enough shore billets to let them go somewhere. A lot of us operators were fearing that if we went total contract maintenance, we were going to lose those billets. But after a lot of soul searching and management taking a look at it, we have sufficient shore billets for the seagoing sailor to go ashore. So I think the fence sitting days in the Navy are over, because we are onboard contract maintenance, as far as simulators. I've seen it in the T-34, the T-44 on aircraft, and now I'm seeing it in the simulators themselves, and it's working fine with availability and with reliability combined.

General Monahan

I might just add as far as the Air Force is concerned, we are, indeed, fence sitting at this time on a couple of major simulator systems, and really haven't made up our minds exactly which way to go. There are a lot of arguments pro and con, and I won't try to get into every single one of those right now, but we clearly see the advantage of the good stable base as far as the contractor support of the simulator maintenance is concerned. We have other considerations that have to do with our maintenance personnel and their duties, their careers, their longevity, that sort of thing, where the simulator indeed plays a role, and also keeping onboard expertise. So at the present time we have a couple of major systems under consideration for contractor support and I can't predict for you just exactly how it's going to come out.

General Pellegrini

One more question, here. This is for the entire panel. A key element of training systems maintenance is maintenance of curriculum and supporting materials. Please comment on our (military/industry) performance in this area and possible methods for improvement.

Admiral Dunleavy

I think we, the military, have to do a better job telling you what we want. I think we're very obtuse at times because we're groping, and we're looking at a grey area of what's in the future, how we want to do it, because things are so dynamic . . . . . but we, the military, have to communicate our requirements to you all and then you all come back and give us the curricula. When we've done that, we've got a fine product that works. When we don't do it, it's another . . . and we have to do it again.

General Oblinger

It is difficult. It's what I'd call a synchronization problem. The Army, a few years ago, realizing the type of individuals we were getting into the all-volunteer force, went to a more simplified design of training materials, fifth grade reading level and some of that. Just about the time we brought that on line, guess what -- the marketplace allowed us to attract individuals who didn't need that material, weren't stimulated by it, and so we got into a Catch 22. I think longer range planning, working together, having flexible devices that don't get locked into one set of utilization specs, probably all of those things would help us keep abreast of our target population.

Panel Member

The only thing I would add to what's been said so far is that that's another area, really, to be realistic is to think about P^3I because the first time around there are bound to be problems with manuals as they come out into the field, and P^3I planning, as part of the overall budget process, is in order for that particular product.

General Pellegrini

One last question and then we'll move on to the next issue. This is for anyone. Occasionally, the Air Force procures a system other than an aircraft. In those cases where systems are protected by high levels of security, the training community falls short on access to information, either because they have no cleared personnel or they lost a fight for billets. Is someone worrying about this?

General Monahan

If it's a problem, we're worrying about it, but I didn't know it was a problem. I guess I can't stand up and say that the basic premise there is indeed a fact. We do have simulators and other training devices that have either in whole or in part some security restriction associated with them, and we do it all the time and we do it every day. In some of our strategic weapon systems, we have the crews fly missions that are totally classified, so I guess I don't understand it as a problem and I guess I can't really respond unless I know that.

General Pellegrini

I might suggest that whoever wrote that question see General Monahan at the break.

Panel Member

I'd like to make a comment on that. It is a problem getting data on classified systems. It becomes a problem not so much after contract award, but certainly during the proposal preparation stage. A lot of it is maintained and carefully controlled, some of it by the primes -- I knew we'd get back to that issue sooner or later. And you have to recognize that in order to put forth an effective proposal, whether you win, lose, or draw, you have to have the data. Too often, in fact, most of the time, it's not readily available, whether we go through the military or the Government or through the company involved direct. After contract award, the compilation of the data usually is our responsibility and most often we can make arrangements with the company or agency to get that data. But it is difficult during the proposal preparation stage when the people who control the data are probably one of your competitors.

General Pellegrini

The next issue will be addressed by Mr. Merl from Sperry and Admiral Dunleavy, and it pertains to total training system emphasis during the requirements generation.

Mr. Merl

Let me start off first by saying that Admiral Dunleavy sort of made that a given before in his opening remarks, and I fully agree with him. I think that at this point in time, where the technology has reached a point we're at, to talk about training systems or training equipments in a vacuum doesn't really make any sense. We're talking about fielding weapon systems and having trained people to operate those weapon systems out in the field, whether it's aircraft systems, ship systems, gunnery systems,

whatever. We're in a world of digital computers and digital technology. A lot of what we field operationally has capabilities for use as training devices operationally in the field by themselves. To look at training systems as we have historically in the past, and as some of the comments that were made before, as an element that gets cut in the budget cycle, is just self-defeating as far as achieving the end objective is concerned. I tried to make the point before that I believe that the definition of the training system -- and when I talk about the training system, I mean the academics, the hardware, the software, and finally, the operational equipment itself or access to the operational equipment -- need to be defined in DSARC I and fully defined in DSARC II.

I think that some examples were already given of systems of this kind where we're moving in that direction. VTX-TS is one; the C-5 is another one. Both the Navy and the Air Force are moving in that direction.

I think one other aspect of all of this, which perhaps is more applicable to weapon system trainers for ships where you have people deployed with the combat system for long periods of time, systems like Aegis-equipped cruisers or Perry Class of frigates where the overall system is well equipped with digital systems, those are very amenable to a training capability after the system has been deployed. That all needs to be taken into account, not after the fact but in the original generation process when you think about defining the overall weapon system.

I just want to add one more point. That doesn't mean that the only one capable of doing that is the prime contractor. It depends on the situation involved and what the timing of the overall program is and the people involved in the process. It can be done in either way.

Admiral Dunleavy

This may be a little bit redundant, but I'm going to answer a couple of questions before I get into the pitch. One is how do you measure training, and it basically is that you kill the target. If you, the flight crew, put the bomb or the bullet or whatever it was on the target, and then you, the maintenance guy, fix the aircraft, the ship, the gun, the tank better this time than you did last time, that's the effectiveness of training. Are you better because of training? Are you better because of the simulators? Are we constantly improving? We have to because we never are going to outnumber the Soviets, but we're going to be smarter and we're going to be better because we train better because of the stuff you provide us. That's the judgment of training and the training system.

And for the fellow who hit me for using the term "bandit," when I said, "you bandits in the sunbelt," I'm a Bostonian and I joined the Navy to get warm, so everyone who's warmer than me is a bandit. That's the way I am -- in peacetime. In wartime, that's something else. A bandit is a nice guy, no problem at all.

Okay, how are we getting this program going with training systems in the early stages of the game? The young fellow to my left did exceptionally well. We did it very poorly before. When I first joined the Navy, we bought an aircraft, we bought a ship, then we figured out what to do with it, how to train with it. We went back to the factory and said, "Hey, Mr. aircraft manufacturer, teach me how to fly the airplane, teach me how to maintain it," and then this cadre of folks went back to the squadron and they formed their own training syllabus. Then the simulator came on the line. Everything was after the fact. In those days, because things were relatively simple, we could catch up that way. Things didn't move in industry that fast. Things didn't move in the real world that fast. We had time to catch up with the bad guy. Those days are long past. We have to be in the forefront, way ahead of the power curve all the time. And we start that in the requirements by sitting down and looking at the total package of the training system, from the word go, as we start looking at what we want to do in the future. We do that by training analysis. How are we going to operate this aircraft or ship or whatever it may be? How are we going to maintain it? We look at it very objectively -- what is the most effective way to get it into the field or the unit, operationally up and ready to go at a high availability rate. It has to be done at the very beginning because with all due respect to the fellow who said you can't fence it, we mentally have to fence something because training is not glamorous. Bright, beautiful aircraft is glamorous. That will never fall out of the woodwork. The beautiful ship, the tank, that will never fall out. But the training will and we have to change that mindset. We have to have the training and the line item and the total package -- the total system. That's where I'm coming from and that's what we really have to make our thrust on. From the moment we decide we need something, training, manpower, personnel have to be in the forefront and maintained throughout. If you don't have the fellow ready to fix the aircraft and fix it well, the greatest flight crew in the world can't fly it. If you don't have the trained people to do any subject at all in the military or even in industry, you're not going to be successful because you won't have the wherewithal to get the job done. As soon as we make the decision that we're going to go for it, the total package has to be looked at and worked through all the wickets, or it all falls apart and becomes a member of the weeds.

General Pellegrini

Someone asked what is P^3I. That's preplanned product improvements.

Let me read this question and we'll share this together. Although there has been much emphasis on specifying requirements, we still see RFP specs, particularly out of NTEC, which specify technology and design detail. Should we expect to see this change?

Admiral Dunleavy

Yes. Another question came up; does that mean the Navy is going to cut NTEC out of the picture. Hell, no. They're our experts on training simulation and they're going to picked up and the brains are going to be used all the time. They're our laboratory of excellence in training simulation and we have to use them that way. But we do not foresee anyone dictating to industry the technical requirements. That's not our bag. Our bag is to tell you we need this at that time to do this job. You, industry, respond. And you're damn good at it. I know it's a very emotional issue -- prime versus the simulator contractor -- but I see you as a team working together. One person said, "You're going to have three major aircraft producers, manufacturers, and they're going to do everything." I cannot believe that. No one is that big and that good to do everything well. We have to have a combination of the aircraft manufacturer or ship manufacturer, and the training simulator manufacturer on the team to give it the total system package together.

General Pellegrini

As you noticed, General Day had to leave and let me welcome to our panel his deputy, Colonel Frank White, who is the Assistant Deputy Chief of Staff for Training, Headquarters, Marine Corps.

General Oblinger

Ben, I'd like to comment on that last question. In the Army, not just the training device and simulator area but in the weapons system development, we are really trying to not have such specificity in the requirements. As you know, we do it from the TRADOC from the user's representative writing the requirement, and then that's translated into the RFP. We really are trying to ask the user to state the requirement in more general terms but give us, the developer and also for you in industry, the operational and operational concept, the mission profile, the outmode summary, as much as they can say about how they intend to use the system, whether it's a weapon system or a device. Then we, together with you, with an up-front dialogue, try to turn that into the best product within the time and the dollars available. We feel that dialoguing that up front, hopefully you will tell us if we've got some inordinate cost driver in there or some high technical item that would give us the last 5 or 10 percent in fidelity and if that's going to cost us 80 percent of the program, we need to know that rather than going for it just because it sounds great.

General Pellegrini

The question here is, why not specify student output performance and throughput? Why not structure our test and support requirements to the bottom line? This is directed at our military panel.

General Monahan

I don't know if student output and throughput are the right criteria; the right criteria has to be that someone sit down and figure out in a very educated and very thoughtful way what does it take to train the troops. I think we all to often get hung up with, well, we very faithfully have to simulate whatever that end item is that either the man is going to be operating or the men and women are going to be maintaining. You may need a very, very faithful simulation of something. If you want to teach someone to dive bomb, perhaps you do. If you want to teach someone to maintain the electrical system on the airplane, that doesn't mean you have to go out and build some very faithful simulations of that airplane. Again, you need to look at the thing from the point of view of what does it take to train the guy. Conceivably, it's a blackboard and a piece of chalk. On the other hand, it may be some of this very elaborate equipment that we see out here across the hall. If we go and ask the question very often of our using commands and our training command, "what would you like to see in a particular weapon system as far as the training equipment is concerned," in a sense you kind of open the cookie jar. They're going to put their hand in it and the tendency is to go out and buy something rather complex and rather sophisticated. I submit, just as General Oblinger did -- and we have this effort underway in the Air Force -- it's a little bit of a cultural change for us, but to sit back and look and say, what does it take to train for a specific task -- let's get some good, smart people to work on that -- and then go out and figure out what you need in the way of hardware, software, or whatever else in order to accomplish the training job.

Colonel Frank White

If I might reinforce what the General said, and perhaps add an additional aspect to it, we hear bandied about very frequently in the training community aspects of skills, knowledge, and attitude. I think we would be remiss, even though we're speaking of training devices and equipment, if we overlooked the requirement that we in the military have -- to ensure that all our young men and women must be capable of performing their tasks under supervision and leadership and something in the way we conduct our training must make them want to do it in their Armed Forces, rather, quite frankly, than in industry, in government, or in other aspects of our lives. So when we talk of the training system

and the spectrum of things we have to accomplish in training, we will use, as best we can, the devices, the equipment, the techniques, the technology which you share with us and which you help us use, but only in creating a young man or woman or groups of them who are willing to be Marines or airmen or soldiers or sailors.

Now, in terms of throughput and training standards, it seems to me that as a matter of philosophy any training program that doesn't start with the determination of what it is we want our people to be able to do when they're finished has made a very severe mistake. We've made a lot of them -- we as a Service and, I suspect, most of us, whatever our business is. We're trying to get better. I apologize out loud to the ISD folks in the audience if I mistate what you're saying, but if you don't start there, if you don't try to figure out what you want your troops to be able to do, you're spinning your wheels or maybe you're lucky. You might be lucky, but you sure aren't going to be good. We're going to do better at that, I hope. We are continuing our efforts to do that in the Corps and, I think, all the Services. I would like to ask those of you in industry, as you deal with us, if you think we haven't specified sufficiently for you what we want our folks to be able to do, if it happens to be me, grab me by the back of the neck and shake me, will you? I'd really appreciate it.

General Pellegrini

There are many more questions, but I think in the interest of time we're going to move on, with one exception. I've got a series of questions here that speak to funding and can we in fact, within Defense, properly support training and simulators with the funds. Let me be so bold as to try to answer that and I'll refer you to several things: the Carlucci initiatives, which turned into the acquisition improvement program, which now are six specific points stressed by the present deputy, Mr. Thayer. I can assure you that by those initiatives, where we merged the planning process -- the PPBS -- with the review process -- the DSARC or SARCS -- you are required to put the funds in there for the total system. Again, it speaks to the acquisition strategy to identify that total system and then the Services to identify the total resource necessary to support the objectives of that system.

Our next issue will be addressed by Colonel White and Dr. Caporali, and it pertains to coordination of government research and development, and industry internal research and development for improved training systems development.

Colonel White

I can deal with this fairly briefly, I believe. As most of you know, we in the Marine Corps are personally responsible for

almost no or very little fundamental basic research. We are, therefore, in a sense very strongly dependent on both the Services and the civilian community for both the quality and the direction of their R&D efforts. We tend, as some of our friends in the other Services say, to steal ideas and things from them every chance we get. But having said that, I think it is incumbent on all of us, both in industry, in government, and in the military, to keep our lines of communication open. We all need to know what we're thinking about, the kinds of things that are bothering us, the very fundamental issues with which we see ourselves having to deal, both in the near term, the mid term, and the long term. The exchange of information may be restricted to some extent by the propriety of discussions among us, and we have to beware of that, I would submit to you, or we will, in fact, bear its evil fruit if we deserve it.

In the areas of simulators, we in the Corps, of course, are concerned about those which simulate flight, those which simulate the firing or effects of weapons, but most exciting to all of us, I must say, are those which present to a commander at all levels the kinds of stimuli that he will have to respond to as he deals with the problems, not just on the battlefield, but the problems he faces in preparation for taking his men and units to the battlefield. How we do that with you, I think, is to continue to communicate, to continue to think, and to continue to cooperate.

Dr. Caporali

Unlike the other issue, I feel a little bit less likely to be the target for any missiles as a result of this one. This is sufficiently motherhood that it's inconceivable to me that anybody can be against having more of it. It's easy to say we need more of it. It's much harder to determine just exactly how we go about it.

Undoubtedly, as the good Colonel said, one of the most necessary management aids is good communication. The Government must certainly communicate to industry in a timely manner their activities, what they want, what their desires are. It's important for companies involved in the trainer and simulator business to have access to government studies depicting changes in emphasis, when and if they occur. It would, of course, be beneficial for industry to share in understanding and have basic knowledge of what the government trainer research is being accomplished at any given time. This would, at a minimum, reduce the likelihood of duplication.

To aid the flow of information in the other direction, a government evaluator has recently been assigned to follow each firm's IR&D efforts, insofar, at least, as they are funded by the Government. That is a bit of a change over what took place just

a few years ago. This has been an improvement, but it is, nevertheless, a single evaluator. A single evaluator, looking at a very specialized corporation or division is one thing; a single evaluator looking at a prime could quite logically be expected to have much more difficulty in ferreting out all of those technologies that might pertain to trainers or simulators.

Now, all of the government-funded research is required to be reported upon. That, of course, is also a help. But even that is not a complete answer. Very often there just isn't enough sense in there, frankly, for the reports to go to the right places.

The communication machinery is in place that could provide the the desired flow of information. The Tri-Service R&D Information Center provides a central data bank for collection and distribution. The problem is getting the information to distribute. And there are some very understandable difficulties in accomplishing this desirable flow, because if we consider it, we don't really have national labs. We have a variety of government labs and industry labs. Understandably, government labs have a tendency to compete for recognition and they must, whether they choose to or not, absolutely must compete for funds. If they show and tell too early, they could lose their ability to attract funds. With industry, early contractor disclosure degrades one's competitive position, and of course, there's a great deal of reluctance to let anything out that you think you have an advantage in too early. Further, the role of government and industry differ. Government R&D is intended to be somewhat more generic, while industry, as a rule, is actually after the development of products.

I've been told that a joint government and industry working group, under the auspices of NTEC and NSIA, is perhaps one of the most successful technology exchange ventures in which we have participated as of late. The group is co-chaired by Hank Okrasky, the head of engineering for NTEC, and Bob Lane of Hughes. This organization is now tri-Service and has eleven active industry members. It began by discussing computers utilized in simulators. It has recently covered software for simulators in depth, and more recently, has expanded to cover general simulator technologies. Apparently, it's an attempt at communications that is proving to have an impact in spite of the fact that it's only been in existence for two years.

With that, I'd like to end my comments by encouraging consideration be given to establishing a trainer R&D bulletin, sponsored by either NTEC or NSIA or both. It could be circulated throughout industry and to industry-interested government agencies. Now, that's admittedly not very much to offer, but may be a step forward and something that we're all going to have to work at. But it absolutely is not going to come easily.

General Pellegrini

Thank you. We have a question here for all of the industry reps. Each Navy lab has an IR&D focal point who tasks within the lab the evaluation of brochures. Why doesn't industry make a greater effort to arrange a debrief from this individual annually?

Dr. Caporali

I'll have a try at that. I think we'd be delighted to have a debrief. Ordinarily, if I understand the question properly, the way the system works, actually, is we all work through a middle man and what we get are the results of those evaluations presented to us by the middle man -- and we are, in fact, debriefed by the middle man. It may be a logistic impossibility to get debriefed by anyone. I know at Grumman, for example, we have hundreds and hundreds of evaluators over the various projects and I'm not sure exactly how we could accomplish this. But in any specific instance, I can assure you that we in industry would be delighted to have that debrief.

Mr. Turner

Amen. I'd echo and reecho that. The problem seems to be once it goes in, you get your evaluation back and you're cut off and the chance of reclama or really understanding how you got your grade or your mark is zip.

Mr. Montalbano

I'd have to add my comment. We've had the same problem. We'd love to get together and get a debrief. I think, more to the point, not only get the evaluation debriefed, I think there has to be a more active support of our IR&D programs, specifically toward the training and simulation aspects. Right now it's not happening.

Mr. Merl

Maybe I don't understand the process exactly, but the evaluators assigned by the Government are, in fact, assigned by the Government, and therefore, if we're talking about another evaluation or another debrief of the labs, that's a special action but we ought to understand the difference between those two activities. I don't think necessarily that the IR&D evaluators assigned by the Government are the people from the labs.

Mr. Turner

I'd like to add one thing. I think one of our problems is that no one to date, in my mind, has recognized what we're trying

to do in the training equipment and systems business as a technology. When you think about it, there's aerodynamics, there's propulsion, ordnance, all sorts of things like that and our biggest problem is we have a myriad of technologies and when we get evaluated, we get evaluated on just little tiny splinters of an overall thing, which is essentially training system development technology. I'd love to see a focus -- somehow -- I don't know how you grasp it, but a focus in our community that honest-to-goodness as a group of industrial and military people, that we are dealing with a technology. I think we'd do ourselves some good.

Comment

I'd like to clarify that question for you. I'm the author. It turns out that in each of the Navy labs there is an individual called the IR&D focal point who tasks his laboratory personnel to evaluate the individual projects within that brochure. He then collects that information and sends it in to what you've been calling the lead evaluator. He has resident, then, in his information base, the comments and scores of his particular lab, his or her particular lab's evaluation of your program. Singer-Link annually sends down John Shepp to receive a debrief on what NTEC had to say, for example, about their program. What is being proposed here is that other firms take a similar interest in presenting to the labs what their R&D program is and receiving back a debrief from that focal point of what that particular lab thought of their program.

General Pellegrini

Thank you. I've got a question here for the military. Will we ever have a commodity command for training development to transition for life cycle support? I read that verbatim; I think the issue is will we have a commodity command who is going to look at that transitioning.

General Monahan

In the case of the Air Force, I seriously doubt it.

General Oblinger

I think in the Army, with PM TRADE we're probably as consolidated in that area as we'll get.

Admiral Dunleavy

In the Navy, we've gone far enough.

Colonel White

The single proponent for training matters at Marine Corps Headquarters is my boss, General Day, the Deputy Chief of Staff for Training. We have made a conscious decision not to create a separate training command, and I think that decision will probably stand for a while.

General Pellegrini

Moving on to our next issue, this will be addressed by Mr. Montalbano from AAI and General Oblinger, and the issue is schedule integrity and enforcement.

Mr. Montalbano

In the interest of keeping the remaining discussion to our schedule, I'm not going to go into the entire discussion of this topic. But I will say that the first thing that comes to mind in talking about schedule integrity is that the first thing is to generate a realistic requirement for the schedule. Then, when the contractors respond to this requirement, there has to be enough incentive required to not only present what is a direct response to the requirement, but to a more realistic schedule.

As far as maintaining the schedule integrity, it goes back to the basic fundamental of management, and I think what is clearly needed is more rigorous and extensive front-end planning. Once you have a good front-end plan and you have developed from that a realistic schedule, the next fundamental is to put forth an effective program management team. I wish I knew an easy answer to that because I would not, probably, be sitting in this panel but somewhere else directing all of you. I don't have any answer, but I know it takes, first of all, management commitment from the very top. We have found throughout all of our programs that once management at the top is committed to a schedule and that has filtered down to the rest of the staff, you'd be surprised at the response of that team. If the management team doesn't have the management support and commitment to that schedule, it isn't going to happen because as soon as they need a different company asset -- and I'm talking strictly from the industry side -- if a company asset is required and they don't have the support of top management, they're not going to get it. And immediately thereafter, there's going to be a schedule problem. Once you have a schedule problem, we know the answer -- you're going to have a cost problem. So we have found in our company that the most effective means to control it is for top management to really make a commitment to that program and see that it's properly staffed, that all of us at the different management levels have the visibility required. That, of course, implies that you have the right techniques and procedures to give

you that. I think only then will you be able to maintain schedule integrity.

General Oblinger

I have very little to add to that, either extemporaneously or from my prepared remarks. The answer, in my view, to the schedule integrity is, as my colleague said, realism. The answer to enforcement, I think, is a good comprehensive contract. Yes, we need the teamwork and we need the understanding, but we've got to get that written down in terms that when the going gets tough, both sides know exactly where they stand and the contract is the way to do that.

General Pellegrini

We are approaching the lunch hour. I was given one question and let me just read this and it might be appropriate to have the military respond to it. It is, would the use of draft RFPs or industry having a chance to concur on the schedule be appropriate?

General Oblinger

I would say, from the Army's standpoint, definitely. And we're trying to do that.

General Monahan

Draft RFPs are appropriate not only for schedules but for many, many hundreds of items that are in there to get the feedback from industry as to -- we have the motto, "We'll take all the help we can get." Scheduling is just one of many things that we'd like to hear comments. That's not to say we would agree if you would disagree.

General Pellegrini

We had one more issue. It's on data requirements and how much is enough. The driver here is is there a way of standardizing the data requirements or at least a methodology for tailoring such requirements.

Let me close this panel by thanking the Services and the members from industry for their support to me and to this conference. I also want to thank you all for the many good questions that we had and I apologize that we were unable to get to all of them. There are many up here and I will attempt, for those that are addressed specifically to panel members, to give them the questions and if there is a name on there they may try to get

back to you. I also want to thank Ron McDivitt and all the members of his subcommittee who provided me great support in pulling this together.

As many of you recognize, there are a lot of hidden agendas in this conference this morning. I don't have to cite them, but I believe if we accomplished nothing else, we accomplished one thing which I believe is very important, and that's to communicate. To hear the views of primes and non-primes and government and industry, and if we keep our sights on the fact that we are all interested in providing the best weapons systems we know how for the soldiers, sailors, marines, and airmen out there, and by doing that through adequate training devices and simulators, we're all dedicated to a very good cause. At the College, I always like to stress to people who come through there that what is very fundamental in our business is to know what that acquisition strategy is, make sure you identify the resources to achieve that acquisition strategy, and resist changes. Don't let anyone change it.

Thank you very much.

LUNCHEON MEETING

NOVEMBER 15, 1983

Captain David L. Osburn

Ladies and gentlemen, it is a true privilege for me to be able to introduce our guest speaker to you this afternoon. He has such an array of credentials that I could pick any one and not go astray. He has been a businessman before assuming his present duties in January of 1981. He is a scholar, who has trod the campuses of some distinguished educational institutions, beginning with St. Joseph's College in his native Philadelphia. Then to England's Oxford. He returned to Philadelphia and the University of Pennsylvania, where he earned his Ph.D. in International Relations and was a Visiting Fellow at the Johns Hopkins School of Advanced International Studies in Washington, D.C. He is an author and has written or co-authored several publications on international defense and foreign affairs. One of his most recent publications, before being chosen for his present assignment, was Aircraft Carriers; The Real Choices. Last, but far from least, he is a naval officer, a Commander in the Naval Reserve, and more specifically, a naval flight officer and qualified helo pilot. His flying experiences have been primarily in the Navy's Attack community. Flying the A-6 Intruder, he is known to have spent some time in those pieces of equipment that many of us are familiar with -- flight simulators. One other note that seems uniquely relevant for the conference this year, since the Air Force led the interservice team, he spent about 14 months in the U.S. Air Force Reserve before transitioning to the Naval Reserve.

Ladies and gentlemen, please join me in welcoming the Secretary of the Navy, John F. Lehman, Jr.

Honorable John F. Lehman, Jr.

Thank you very much for that kind introduction, Captain, but I do have to correct the record a little bit. I did not go to Oxford; I went to Cambridge. And the reason I didn't go to Oxford was I could not qualify for admission. You see, my parents were married.

I've been looking forward to this occasion to get together with you all and talk a little bit about the Navy and the Marine Corps. I would suppose that by now, half-way through your conference, that you are well up to speed on what's going on in training equipment and readiness and so forth, so instead, I would like to try to close the gap that I believe exists, even in the Defense community, even among yourselves -- the gap in perception versus reality in what is really happening in Defense.

To start with, it is well to go back and remember where we came from. We came from nearly 20 years of sustained unilateral disarmament, during which we allowed our strategic deterrent to be cut in half in terms of deliverable megatonnage, to be cut in half in terms of strategic nuclear delivery vehicles. We've allowed, during that time, our fleet to drop from 1,000 ships to 460 and our aircraft carriers from 24 to 12; our Army divisions to be first cut down to 13 and then hollowed out; our Air Force to have its bomber force cut in half and all modernization deferred in the strategic field, and so forth, at a time when our principal adversary, the Soviet Union, was engaged in one of history's most sustained peacetime military build-ups of about 4 percent compounded real growth every year since about 1962. That is the setting. You are all familiar with the manifestations of that shift in the balance, that reversal of superiority, and I needn't catalogue for you the sad chronicle of the 70s and the decline of American power in the world and American stature and the confidence of friend and adversary alike as to our reliability.

That is just prologue to what history will record, I am confident, one of the most significant changes in direction in modern American history. That was the defense recovery initiated three years ago. It started, had its origins, in Congress in a bi-partisan effort to add money beyond what the Administration wanted, Congressional initiatives, like the Nunn-Warner Bill, to begin to restore the tremendous erosion of compensation to our Armed Forces. But it was crystalized after the election with a mandate that President Reagan undertook to carry out to restore all of our Armed Forces to the position that they had lost, and that was simply the position to be able to meet our commitments.

Let me shift focus strictly to the Navy and the Marine Corps. The objectives that the President set were, first and foremost, to restore the quality of the personnel. The President has always held people first, the highest priority. That was the first requirement that was looked to in the preparation of the new Reagan Defense program. Second, for the Navy, a major force expansion of some 30 percent to build the Fleet up from 460 ships to 600 ships, and to increase our aircraft carrier force from 12 to 15 and our attack submarine force from 80 to 100, increase our amphibious assault capability from one Marine amphibious force to an additional Marine amphibious brigade -- an increase of some 50 percent -- and a rejuvenation of our mine countermeasures program and a lot of other programs with which you are familiar. A very ambitious program.

Here we are, three years later, and four budgets later. As you can see, knowing that the conference is meeting on appropriations tomorrow, I am an optimist. I believe we may get

a bill before the end of the year and that will be the fourth Reagan recovery Defense budget, starting with the '81 supplemental.

Let me quickly review for you what has happened in that nearly three years' time as a result of that bi-partisan turnaround and the Presidential mandate. Personnel in the Navy and the Marine Corps has jumped from an all-time peacetime low of 44 percent career retention just three years ago to an all-time peacetime or wartime high of retention, running now at 80 percent for overall career enlisted retention. We have made 100 percent of quota every one of those three years in recruiting and most dramatic of all, most exciting, is that we have never had -- ever had -- since we've been keeping records in the 208 year history of the Marine Corps and the Navy, the kind of quality that we have today -- by every measure. Ninety-two percent of our recruits are high school graduates. From not too long ago in the 70s when a third of our recruits were from mental category 4, we are down to 6 percent. We have cut the AWOL rate in half during those three years. We have, by actual statistical measure, cut what was a terrible drug abuse problem where actual surprise spot checks showed that 48 percent of our sailors and nearly as high of our Marines tested positive in having used some type of cannabis in the previous 30 days -- that was 2-1/2 years ago -- until today, all of our statistics show we are somewhere -- with the same kind of urinalysis testing -- somewhere between 4 and 8 percent, Fleet-wide, Fleet-Marine force-wide.

So the news in personnel could not be better. I came into this job as a very real skeptic about the viability of the all-volunteer force. In three years, I have become a true believer. Not only does it work, but I am convinced it gives us a better force in every way than a peacetime draft. That's something everyone in this country can be proud of. We are attracting some of the very finest people from around the country to come into the military and because what they find today in the military is so much better, we are holding onto the best of these people. That's good news and that, more than anything else, is changing the whole texture of our military capabilities.

Second, the expansion of the Navy in its force structure required an ambitious program of building two more aircraft carriers and about 30 ships a year. We are on course. Essentially, the 600-ship Navy is in hand. We have stayed about 30 ships a year, which is more than double the program we inherited, and we now have under construction over 100 naval ships and we have built the Fleet up from 470 to 517 ships. We will have the 600-ship Navy by 1989. We have gotten all of our aircraft carriers that we will need through the end of this century under construction. We delivered the 13th,

the Carl Vinson, last May. Next September we will launch Teddy Roosevelt, which will be the 14th deployable carrier. Abraham Lincoln delivers in 1986, will join the Fleet in 1989 as the 15th carrier, and George Washington will deliver in 91 to replace Coral Sea at about 50 years of age.

The battleship program you're all familiar with, having read the newspapers lately. New Jersey is on station in Beirut in one of the longest shakedown cruises in naval history. She was to have gone out for 2-1/2 months for an exercise in WESTPAC, started in Thailand, the Philippines, was ordered to Central America, was on station off Nicaragua, and was ordered through the Canal, made 25 knots non-stop for 6,000 miles to support the Marines, and the President noted in his speech last week that it was New Jersey's arrival that provided the breakthrough for the cease fire.

Iowa is following suit and will join the Fleet next spring. Missouri is in this year's bill, and Wisconsin will begin work next year. So we're on course; it's being accomplished.

The less dramatic aspects of the naval recovery and the Marine recovery program are the readiness and the sustainability issues of our training, of our spare parts, of our ammunition supplies. You know, when I was sworn in, the day I was sworn in, we did not have enough ammunition to fill the magazines of our dwindled fleet even once. We had less than 10 days' supply of ammunition in some of our most key weapon systems. It was a national scandal and nothing less. Today we have greatly and steadily improved that sustainability. We will achieve our 60-day objective before the end of this decade and every year is showing the realizability of those objectives. Spare parts we have trebled every year and maintained that level -- trebled the amount of money being spent on spare parts from the program we inherited. We doubled the money going into airplanes, for instance, but trebled the money going into aviation spares. And it's paying off. The readiness of our squadrons, Navy-wide, has jumped 16 percent in three years. The S-3, as a good example, jumped from 30 percent for want of spare parts, 30 percent mission capable, to over 70 percent where it has stayed for the last full year.

So my brief review is to say that we are on course. We haven't wavered, we haven't reduced the program, we will achieve the 600-ship Navy. It will not be a hollow Navy. The ammunition lockers will be full. And we are doing it in spite of a steadily racheting-down of the available resources originally asked for by the President. The reason we've been able to stay on course, despite lowered expectations of real growth, is that we have achieved tremendous success in bringing more discipline and more competition into our procurement. Despite

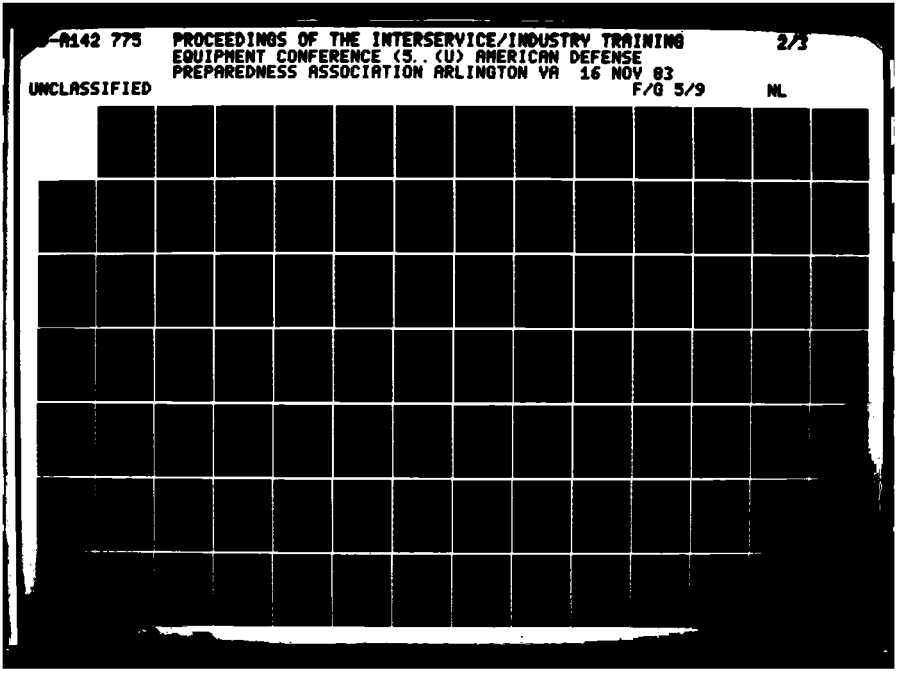
the stories that you are all well aware of -- some of you have been personally involved in -- the spare parts, paying $110 for diodes and $400 for claw hammers, we are making tremendous progress. There is a long way to go and I am convinced that we can continue to stay on course and compensate for a lowered level of support from Congress to within a certain degree, by the continuing success of increasing accountability and increasing the level of competition. Do you realize that three years ago, only 15 percent of Navy procurement was competitive? No wonder we had such a wealth of horror stories about unpriced buying orders and $700 screw drivers. Today, we have raised in shipbuilding competition from 20 percent of the dollars to 94 percent of the dollars. We are going to pursue dual sources for virtually every commodity that we buy in numbers greater than single digits. That competition and that increased combination of providing more incentive for good performance and more accountability for bad performance is going to see that we do stay on course. It works. It pays off.

We have a philosophy that we don't believe that, as a rule, our contractors are making too much profit. In fact, in most cases it is the reverse. What has contributed so much to the unilateral disarmament of the 70s was that costs were not controlled, not profits. And we have tried to provide additional incentives to increase profits available to the contractors. But to drastically reduce costs. That is where the problem lies. The Teddy Roosevelt is a good example. We renegotiated the contract we inherited with Newport News and got agreement to a 14-month earlier delivery date and a $100 million reduction in price in return for a $26 million bonus upon achievement of that 14-month earlier delivery date. Twenty-six million dollars of profit and it will be well earned. I'm happy to report that Teddy Roosevelt is even ahead, today, substantially ahead of that accelerated schedule. The costs are being held down and the total price to the taxpayer will be significantly less.

So I hope I have served a little bit to close some of the gap in perception. We are, indeed, on course. We are bringing the costs of doing business down and the pay-off, in terms of our position in the world, is already being demonstrated by not only the performance of our armed forces in places like Grenada but the reaction of our adversaries and our friends alike. The future looks very good for the long term as long as we stay on course.

Thank you very much. I'll be happy to take your questions in the remaining time available.

A question is, what is being done about the terrible [illegible] ment that the Marines have. Well, we get rid of it wherever we find it. In my judgment, the Marines are better [illegible]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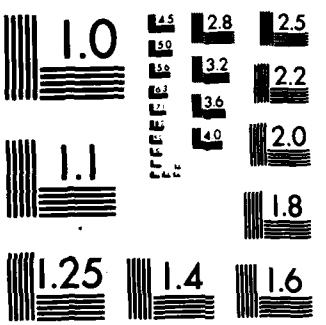


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

of our armed forces in terms of their ammunition and their weapons. They have never been in better condition. Their weapon systems are in excellent condition. The Marines have a different philosophy than some other elements of our other Services, including the Navy, and that is, more than any other Service, the Marines have an institutional wisdom that the best is the enemy of good enough. The Marines, for instance, refused to go to the M-60A3, let alone the M-1 tank because of the greater reliability of the M-60A1 -- older, less expensive, but more desirable from the Marines' standpoint. The philosophy runs through all of the equipment that they procure and they are not in bad shape at all. As I said, I believe they are in better shape, relatively, than the other Services.

In terms of medical facilities, as a nation we allowed, during this period of unilateral disarmament, our combat medicine care to disappear, in effect. The last hospital ship was mothballed and we have had, three years ago, no plan to actually ensure casualty care in any kind of contingency virtually anywhere where there were not existing facilities in place. A national scandal. We moved very smartly to remedy that with a major emergency plan to deploy field hospitals, which we've done, and a major program to build two hospital ships with 1,000 beds and 12 operating rooms each. The first of these is now under contract; the second is in the 84 bill and that's going to go a long way towards filling that gap. The medical care is excellent in the Corps, generally. I think that the tragedy in Beirut demonstrates that the system is set up to react immediately, to provide surgical care on scene immediately. Our amphibious ships have fully qualified mini-hospitals aboard with fully qualified surgeons and operating rooms, and the evacuation system that was used was very, very fine and we would have no criticism, the Marines have no criticism of the medical care that was available as a result of that tragedy.

Question -- (Cannot be heard)

Dr. Lehman

Well, I have personally traced a lot of the good equipment that I have used, like A-6s, back to civil servants in the procurement process, to whom I am personally very grateful. I think that we have an excellent combination of career civil servants and uniformed people, in which the Civil Service is leading the way, rather than the reverse, in teaching the Services that competition has got to be brought into the system more than it exists in its institutionalized form. In many ways, the Civil Service, I believe, is the least appreciated and highest body of talent -- that is the Defense Civil Service -- anywhere in the civilian government. It's a tragedy that we are unable to get Congress to sufficiently recognize the sacrifices, the quality,

and the talent that we have in the Civil Service so that we can get adequate compensation. That's a terrible disability to our Defense procurement that we have an unrealistic pay cap on our civilian employees that makes it very difficult to compete, and requires those dedicated people to make an inordinate sacrifice to stay in. I hope that someday we can do something about that because it is a crying need. Since I've been Secretary of the Navy, we have had a 50 percent loss in our senior executive service and it is 99 percent due to the fact that we simply can't pay and compensate our people adequately at the senior levels. So, if there's an agenda item that needs fixing by Congress, that is it.

The next question is, where are we with the Naval Reserve; where are we going? I think that in the last three years we have set in motion the most far-reaching change in our Naval Reserve that has ever taken place. We have moved to a concept of what we call horizontal integration of the Reserves, rather than a vertical integration where we shove the old equipment that doesn't operate any more from the Fleet off to the Reserves. We are now truly viewing them as an immediate mobilization asset across the functions of the Navy, and we are now moving to put first-line equipment into the Reserves so that they are truly integrated and can go to war the first 24 hours. We are putting 27 new frigates into the Reserves; the first of them are already now operated by Reservists -- new . . . Class and 1052 Class frigates. We are moving to modernize our two Reserve carrier air wings with Fleet-compatible aircraft. In fact, we have dropped from the Navy program the 15th carrier air wing. There will only be 14 active wings, because in wartime and mobilization, the first of the Reserve air wings will be immediately assigned to whichever carrier is in overhaul; the second will be assigned to the carrier that is in SLEP. That's horizontal integration. It is underway. It is very far-reaching and it makes a reality the old bromide that it's a total force concept. It hasn't been a total force concept, with few exceptions, in the Navy. The Navy has lagged behind the other Services. We're now catching up and we'll pass them before this decade is over in real total force.

The question is, would there be benefits to a peacetime draft? I am very sympathetic to the view that all citizens owe their nation service. National service is a very appealing concept, in my judgment; but it is unworkable in a nation of our size. We couldn't use the influx of 18 year olds. There are just not enough public works projects. The military can only use a tenth of the 18 year olds that would be eligible each year. That means nine out of ten would have to be sent to work on social work and other things and we would have to organize a whole vast new federal bureaucracy just to process that influx. Short of that, a draft, I believe, is inequitable by its very

nature. If we can only take one out of ten, then one human being out of ten human beings is forced to alter and serve while the other nine get off scot-free, no matter how fair you make a lottery. But more than that, I believe sincerely that we are getting a better professional force by people who want to be in. We are no longer getting the kind of people that were sentenced by local magistrates to jail or the Army. And that's not a joke. A very reasonable percentage of all the Services got recruits from that source, by the way. Today we can afford to be very much more selective, and we are getting kids who really want to be in there. As a result, we're finding much lower attrition rates, much less wasted training, and a very much more highly motivated professional soldier, sailor, airman, and marine. So on net, I believe the draft is not desirable now that we know that we can make the volunteer force work. I think it definitely produces a better armed force. I speak for the Navy and the Marine Corps, but I believe the other Services would echo it. Everybody has a certain amount of concern because none of us has a crystal ball that hasn't a few clouds in it -- what's going to happen as unemployment drops to 5 percent, 6 percent and the steady reduction of the population of 18 year olds continues through the rest of this decade. We don't know whether it will continue to work. I think it will.

Question

What about the new SSN design?

Dr. Lehman

There is none. We have decided it is time to design a new submarine. There are enough advances in the basic technologies that we now see we can make genuine orders of magnitude increases in capability by a new design. That's not to say that the 688 is not still a good design. We intend to build 688s through the rest of this decade, but there are certain capabilities we would like to have that we can now get because of technology. We do not have a design yet. We can't tell you how big it will be or what it will look like. We have begun the process in a serious way and it's going to be a very important program to the future of the Navy. We have an edge in nuclear submarines, overall; we've got to keep it. It is essential. Without it we cannot have maritime superiority and the new sub is an important part of that. This is an interesting contrast, by the way, to our approach to aircraft. We have made, during the same period, a decision that there is not that pay-off to go to a brand new fighter plane or attack plane. We do not find the increase in capability available from the advances of technology in aerodynamics and propulsion to warrant going to a new design, so we have made a very firm decision to stay with the F-14 and the A-6 and simply improve them, awaiting a period, as we now have in

the submarine world, where it does make sense to put up the $3 to $4 billion non-recurring development to invent a new flying machine. They are two different kinds of problems in which we've come to exactly opposite decisions.

Question -- (Cannot be heard)

Dr. Lehman

There are two very different answers. One of my predecessors, James Forrestal, as he witnessed the raising of the flag on Iwo Jima, said, "That flag on Suribachi ensures there will be a Marine Corps for another 500 years." I think the performance of the Corps in the last couple of years ensures that we can extend that another 500. They have shown that they are the rapidly deployable force, self-contained, can go in anywhere in harm's way with all of the assets necessary for forceable entry, and the amphibious assault, which so many systems analysts wrote finis to 10 or 15 years ago, is just as viable and just as important a national tool as the Falklands and Grenada showed in micro-scale, as it ever was and in fact, moreso. So the Corps' future is an essential part of our national security structure. We do not envision any force expansion; it's the right size. We will be increasing end strength, but the main thing that we are doing is to continue to modernize and see that the Corps has the ammunition and the readiness that allows them to do what they do so uniquely well. The future of what is now Central Command is a more complex question and so I'll duck that one, thank you.

Question -- (Cannot be heard)

Dr. Lehman

I could not agree more with Admiral Rayburn and with that specific point. I believe that without question the greatest problem we have today in Defense procurement is the process of depersonalization and clericalization of the entire development and procurement process. The $110 diode is an excellent example of what has happened in this dispersion of accountability in authority, where no one person has responsibility for buying that spare part. It went through six different agencies within the Navy and in the consolidated agencies in the Office of the Secretary of Defense. Thirty years of reform have destroyed the ability for common sense to operate in a large part of our procurement process. Every time we have a perceived problem, the maverick doesn't meet its spec, immediately a reformer stands up and adds another 30 layers of bureaucracy to the process. That has gone on year after year. There are nine independent Defense agencies that have some piece of some parts of Service procurement, and the ability to keep a straight line of authority and

accountability, for which one organization or one person may be given the authority to carry out a task like Polaris and be held accountable if he pays $110 for a 4¢ diode, has been lost. In a large part of our system, that's the biggest problem we have. I think that Cap Weinberger has done more than any Secretary since Jim Forrestal to reverse that. He has provided a tremendous restoration of authority to the Service Secretaries, and we are held very strictly accountable on those programs that are still within the Service purview, like shipbuilding, like aircraft, like most weapon systems that are not joint programs. I do not lack for authority to manage effectively programs within the Navy Department and I should be held strictly accountable when those programs go awry. But I refuse to be held accountable -- and I defy any of you to find any one person that you can hold accountable -- for a screw-up of a procurement that goes through six or nine separate agencies that often never talk to one another and to whom no one person has any idea how the pathways operate. That will be the richest field for reform to get rid of the 30 years of reform we are stuck with for the next ten years.

Thank you very much.

TECHNICAL PANEL

ADA IN AIRCREW TRAINING DEVICES

Dr. Robert Mathis

Let me thank Karen Bausman for having organized this panel, and Lt. Col. Bob Carlson for helping us with slides, etc. You two work together, as I understand, out at Wright-Patterson.

For those of you who don't live in Washington, I have to call to your attention one of the other daily papers -- you all read the Washington Post, and I won't comment on their political philosophy -- but they did have an article in yesterday's paper, the one I get at home, saying, "local businesses must scramble to learn new computer language." My wife called this to my attention and thought I might be interested that American business, industry, and government might be using an entirely new language by the end of this decade -- a new computer language. The revolution has already begun and the switch to the new ADA computer programming language is on. The U.S. Department of Defense directive issued earlier this year declared that the computer programs for all military contracts be written in the new ADA language, starting January 1. Well, journalists never quite get everything right. But they did get January 1 right, and that's January 1, 1984. They forgot the trademark on ADA and lots of other stuff, but ADA is here -- it's coming. The end of the article was particularly relevant. It said, "More information on ADA and the ADA training course is available at the Interservice Industry Training Equipment Conference going on at the Washington Hilton through Wednesday." Does anybody know about that conference?

Let me apologize in advance. Owen McOmber from the Navy, NAVMAT 08-Y, will not be with us today. I'm going to fill in for him and we're sort of going to rearrange the schedule so as to give a little bit more time to the people who are here. At the end, I'll pick up on some of the Navy's plans for ADA introduction, but at this conference we wanted to concentrate on some of the applications in training and simulation. Even though I'm in charge of the ADA program, I've got these really competent people who help me out and one of them is Virginia Caster, who is at AFWAL at Wright-Patterson, and has been very active supporting the ADA program and in particular, is in charge of an environment evaluation and validation task which we've just set up. She has a Bachelors and Masters degree in Electrical Engineering, has been very active with other computer and software developments, including the 1750-A program, and she is associated as a member with ACM and ADA Tech. So I'm going to turn to her for a nice overview of the ADA program.

Ms. Virginia Caster

Thank you, Bob. I think I have a very distinct honor this afternoon being able to describe something of the Ada language, the Ada programs, some of the activities that are going on. Even though I only have 10 minutes, I hope I can impart to you some of the enthusiasm that I have about the Ada program, because I find it an exciting area and I've enjoyed tremendously my working association with the Ada Joint Program Office, which I hope will continue for some time.

I hope to answer some of your questions with regard to the Ada programming language. What is Ada? Basically, it's a computer higher language which was intended for design with use for embedded computers and embedded computer applications. For most of you, you know that an embedded computer system is comprised of both the hardware and software systems which then comprise even much larger systems. Some examples include communications systems, onboard aircraft navigation systems, weapon control systems, any of the real time control systems. And there are certain characteristics associated with programming for embedded computer applications, some of which include parallel processing, man-machine interactions involving real time control, automatic error recovery, and sometimes unusual IO; for example, input from sensors and output to some control devices.

Problems associated with programming for embedded computer systems include the fact that the systems themselves are very large, sometimes millions of lines of code. Their life cycle is also very long time span, sometimes as much as 20 years, and the changes are themselves quite an issue because throughout that 20-year life cycle, if not longer, there are constant changes being made to that software. So there are a number of problems related to software development for embedded computer applications themselves.

Why is Ada important? Primarily, the use of the Ada language, as well as Ada programming support environments, will help us control the cost and improve the quality of software that is developed. That is the ultimate goal here, and the Ada program involves more than the Ada language itself, which has certain unique characteristics which are beneficial to embedded computer applications. The idea of the Ada program is also to include the use of Ada programming support environments, to also encourage the use of modern software engineering practices, and combined with the language and the practices and the environments, the Ada program itself represents a composite of all of these areas.

How was Ada developed? Back in 1975, there was a DOD high order language working group established, called the HOLWG. It consisted of members from the Army, the Navy, the Air Force, DCA, NSA, and so forth, and the purpose of this HOLWG was to establish

some of the requirements for higher language associated with embedded computers. In June of 1978, a . . . document was produced which presented a very comprehensive list of requirements for a higher language for embedded computers. Now, over 23 existing higher languages were compared against this extensive list of requirements, the end result of which was not one of those 23 languages was considered powerful enough to meet those requirements which were established. As a result, an international competitive effort was then established for the development of the language which would meet those requirements. The award was given to CII Honeywell . . . in France, and in July of 1980, the initial draft of the language itself was published.

This shows how the procedures by which the Ada language became a standard, and the emphasis throughout all of these reviews was on high public review. The public was constantly involved throughout this review process. The language now, having become an official ANSI and MIL-STD 1850, as of February of this year, is enforced through an Ada validation organization, an AVO, which was established under the auspices of the AJPO, for the purpose of validating Ada compilers. An Ada compiler must complete, without exception, successfully complete all the tests within an Ada compiler validation capability test suite. Once a compiler has gone and completed all of those tests, it can then be issued a validation certificate by the AVO. In addition to the standardization, the Ada language, the Ada name is a registered trademark by the Department of Defense Ada Joint Program Office.

How did the Ada language receive its name or who was Ada? What is normally considered somewhat inconsistent with government, A is not an acronym here. Ada is the name of Augustus Ada Byron, who was the daughter of Lord Byron, the poet, and who was considered the first programmer in the sense that she helped Charles Savage with his analytical engine. The Ada programming language is named in her honor. So you notice it is a lower case d and a lower case a for Ada.

Objectives of the overall Ada program? The Ada Joint gram Office, as you've already heard, has been established for the purpose of executing the Ada program. One of the objectives is to implement Ada as a standard. The idea here is by making the language a standard, then we can promote portability, not only of software but of personnel, as well. To promote the adoption of Ada within each of the Services, there are plans by which the Ada language will be implemented and you'll be hearing a little bit about that from the speakers to follow; to provide Ada education and training, and this is critical because we need a broad Ada knowledge resource pool for software development; and to provide Ada programming support environment systems.

What is an Ada programming support environment? Primarily, it's a collection of tools, an integrated set of tools, that will

help promote the development of software, using the higher order language, Ada. It contains some of the essential tools; for example, a compiler and editor, a linker-loaded, that sort of thing, in addition to other requirements analysis tools, which are useful throughout the entire life cycle. There are two major aspects of a programming support environment, one being the data base, the data base which is then the central repository for all the information which is gathered throughout the development of the software, and the idea of a host-target combination. Most of our target or embedded system -- for example, in the Air Force, a 1750-A is too small -- on which to develop the software and so we have a host system on which the program support environment is hosted and software is then developed for a target system and the software is then downloaded to the target.

Back in June of 1978, the DOD sponsored a workshop in order to discuss environment alternatives, and the result of that workshop was a document entitled Pebble-man, which sort of addressed some of the requirements for an environment. In February of 1980, a Stoneman document came out and this is the figure which many of you, perhaps, have seen which represents an Ada programming support environment. It is somewhat simplistic, but the notions there are that in the very center, the level 0 is your host operating system; that is, machine-dependent software. The KAPS then, which stands for Kernel Ada Programming Support Environment, consists of extensions to that operating system, such that when imposed upon the level 0, you then have a virtual operating system that looks the same to all of the tools. There is a level of interfaces in between the tools, then, and the operating system and that level of interfaces is called the Common . . . Interface Set. The next level, level 2 there, called the MAPS -- a Minimal Ada Programming Support environment, consists of the minimal set of tools that are needed. Then the . . . is all of the tools.

Current Ada efforts -- within the Government, we have development of three Ada programming support environments. The Air Force is developing the Ada integrated environment; the Army, the Ada language system; and the Navy is adapting the Ada language system for Navy application. The KAPS interface team, a Navy-led organization, is developing a common set of interfaces. The Air Force is in charge of a committee to develop evaluation and validation criteria. There is an Army effort to develop life cycle methodologies for Ada.

That pretty much summarizes. I know I've gone through it very quickly, but I've tried to give you an overview of the language itself and some of the efforts that are ongoing. I'll be happy to answer any questions at the end of the presentations.

Dr. Mathis

Thank you very much. I'm glad to know what I'm working on. Let me share with you my business card. It has all the addresses on it and we run an Ada information clearinghouse from our office so that if you want any more information, please don't ask for me because your phone messages will just go into that great phone message place in the sky, but if you tell the receptionist what you want, she'll put you in touch with the person who can answer that question directly. Our phone number is (202) 694-0209.

The first Service representative to speak is going to be Jim Hess, who is at DARCOM. Since nobody else is here from the Army, I guess I should say something nice about the Army. In any case, Jim has been very involved with the Ada program, has served as the ALS -- it's being managed as a weapon system and he served as the weapon system manager from DARCOM. He's now been given larger responsibilities for overall coordination of the Ada program, both the ALS and other aspects, in the Army and also for coordination of the software technology initiative that we call STARS. Jim has played a very important role in all this. He was talking about his background in electrical engineering and a Masters Degree in industrial engineering from Texas A&M, which was my father's alma mater, so that's just another example of his good qualities.

Mr. James A. Hess, Jr.

Thank you, Bob. It's really a pleasure to be here this afternoon. I wanted to start with a slide showing some Army systems, just to get you in the right frame of mind. When we start talking about the Ada program, we're really talking about computer language to be used on embedded weapon systems. We've grown beyond that slightly as we talk about mission critical systems, and I'll emphasize that as I talk today. But there's something else I want to emphasize. I had a luncheon conversation today with an Army colonel who is one of our project managers. I was telling him where I was and what I did, and he said, "Wait a minute -- how can you be a weapon system manager for a language? I've never heard of such a silly thing." I think the important thing to point out is that Ada is more than a language. Ada, within the Army and the other Services, is a complete set of tools to let you build software using that language. That's the project that we manage out of our office.

This afternoon, what I'd like to do is give you a very brief background of where the Army is coming from in Ada. I'd like to talk a little bit about the strategy and the policy that we're developing to require the use of Ada within the Army. I'm going to talk about some of the products that we have, virtually on the edge of delivery at this point in time, and a little bit

about scheduling. I don't know if I can fit all that into ten minutes, but I'm going to try.

By way of background, within the Army you have to realize that up until today we basically have a wide multitude, a wide variety of systems containing a large number of instruction set architectures, a large number of computer languages used to program. At last count, there were something in the order of 80 different instruction set architectures that we had to support and over 150 different computer languages used to program those instruction set architectures. All those had to revert to the Army or to our contractors to continue to support them as we deployed into the field. As we look toward the future, we see two forces tending to push those two things into line. On one hand, we see our post-deployment software support responsibilities. We recognize within the Army that we need to take control of the management of what we do to our software or weapon systems and the software in those weapon systems once we get them and once we deploy them. So we have established 11 post-deployment software support centers within the Army to take on that role and to make sure that gets done. On the other hand, we recognize that there's a need for us to manage up front what we're allowing to be put into our weapon systems in the way of software, hardware, and how they will be supported. So I'm going to talk a little bit about those two things, but basically those are the forcing functions that are forcing us to the use of Ada and also in our embedded systems to the use of the military computer family that is now in advanced development.

Ada is kind of a blessing and it's a curse to the Army. It's a curse because all the eggs are in one basket. It's a blessing because it's a good language. Let me explain that. You look at the list of approved languages in DOD Directive 5000.31; there's not one Army language on that list. We used to have TACPOL a while ago -- we've taken that off. The Navy has CMS-2, the Air Force has JOVIAL. They have some back-up, they have something now to program their systems in. The Army doesn't have a standard language and that's what led to our proliferation problem.

We also find that we have a very strong commitment to Ada. You heard Bob mention earlier that Dr. DeLauer, on the 10th of June, signed a memorandum that said you will use Ada starting on January 1, 1984, for systems entry and advanced development. We did that three years ago. Our Assistant Secretary signed a letter that said you will use Ada starting January of 1983. It turns out we were a little too optimistic and we didn't have the tools in place in January of 1983, but we're serious about doing it now, and we're trying to get that message out to our project managers as they start to build their systems now in advanced development.

The third thing I'd like to point out on this chart is when we look at software we don't just look at the language Ada. We look at the environment that we're going to use for Ada, and in fact, we have had a development program underway for about four years to build the complete programming environment in Ada to support Ada. Basically, at this point in time we've announced to industry -- we've announced to the world, essentially -- that that environment is ready to hand off to people who would like to take it and move it onto other systems. We've done that with two Commerce Business Daily announcements; industry has responded very favorably and we got over 66 inquiries from industry with respect to getting the Ada language system, our environment, and reporting it to their machines and their targets. As of last Friday, 26 of those companies have signed agreements with the Army to do that. So we are looking, long haul, not only at the language but at the complete environment and getting that on as many systems as possible.

What I'm really supposed to talk about is implementation planning and how are we doing that. If you look back at the way we build our weapon systems, it doesn't really make a lot of sense to say as of this date, magically, all of our systems are going to be programmed in Ada. What does make sense is to say as of this date, we're going to start looking to see if Ada makes sense. And we're looking to see if it makes sense from two real aspects: to see if it makes sense from a technical point of view, whether we have, for example, the co-generators to support the target machines we're going to put in the battlefield at the time we're ready to start our development; and if it makes sense from a life cycle cost viewpoint. What resources do we have to invest to make sure we get there?

Basically, what this chart shows is the evolution of the policy within the Army over the past several years in the area of computer resource planning. I'm going to skip 80 and 81, and let me concentrate on 82, which is basically where we are today. That says we're no longer looking at just embedded weapon systems. We're not just looking at those systems that go in the command and control environment, or those systems that are highly embedded in an artillery shell, for example. We're looking at anything that directly impacts the mission and that includes training devices and simulators as being candidates for the use of Ada. We're also looking at earlier planning. Up until very recently, we required our project managers to prepare a computer resource management plan and submit that at Milestone II, their entry into full-scale engineering development. We've now said, and the policy is in the print plan and the new Army regulation on basically acquiring these systems, AR 70-1, you will submit your computer resource management plan prior to Milestone I. We're backing up several years to make sure we catch the systems and do that planning intelligently.

As part of that planning, you will identify the language you're going to use, the host computer you're going to use, the target computer you're going to use -- if you can, or the selection criteria to pick those -- and who is going to do that software support once the system is deployed. What we're trying to do is force a lot of thought up front as to what burden we're going to assume when we field that system.

Finally, if you elect not to go to Ada, then, in fact, you have to get a waiver. The waiver process is defined within the Army very well, I think. We have processed our first waiver since the DeLauer memorandum just a couple of weeks ago, and the project manager had good justification for not using Ada, and he was granted a waiver. We expect to continue to do that. Where it makes sense, Ada will be waived. Where it doesn't make sense, you'll be required to use Ada.

CRMP is computer resource management plan. It's basically a plan that indicates how you're planning to use those elements I mentioned.

What about language? Basically, we've said use DOD Directive 5000.31. The DeLauer memorandum now says that Ada is approved on that list of languages. We expect Ada to be used as a PDL, starting immediately. We expect that the implementation of Ada is going to be event-driven based on the availability of those tools to support the systems we're building. I think the key thing is, we're expecting that people who use Ada, people who code in Ada, will eventually be able to support it using the environment that we're building, that we're paying for, that will be provided GFE to our contractors and will be provided to our contract managers.

Let me talk a little bit about products. Bob didn't mention it, so I will, but there are currently three validated Ada machines that you can go out and use. One is the Ada translator that was developed up at NYU -- not really suitable for developing software for embedded systems. It does run slow, but it does provide a complete . . . of the language. Rolm and Data General have announced and have been validated with their Ada compiler, targeted to their machines, and Western Digital/. . . have recently completed their validation. So there are validated compilers out there. The Army's Ada language system is now in, hopefully, the final stages of development and we expect to be validated by October of 1984. That environment will then be provided GFE. Look for it around the first of 1985.

Basically, the environment that we're developing towards is target to a VAX-1178, which is a host machine. This probably doesn't do a lot of you a heck of a lot of good. We're also retargeting to our military computer family. The Navy has picked

up a task to retarget it to the UYK-44 series of computers. The Air Force is funding the retargeting to the 8086 processor by INTEL. We're currently looking at some accelerated tasks to bring Ada and to retarget the ALS to existing commercial machines. One of those we're looking at very closely is the 6800; the other one we're still studying.

So basically, besides bringing you a whole suite of tools, we're attempting to do that to the machines that appear to be of high interest to the Army and the other Services on the battlefield.

As far as tools, the Ada language system, as Ginny mentioned, does contain the traditional tools you might expect in a programming environment -- the editors and the compilers and all that stuff. We've also developed something called the SMCS, the Software Management Control System, which provides some configuration management type tools. That can be run on the ALS or with the ALS. We're also looking now at building some requirements definition tools. In fact, that's one of the first STARS tasks to have been funded. That work is now underway, assuming that we get our 84 money out of Congress. That will continue. So we're moving forward on those fronts.

In the area of training, which I think is of vital importance to all of you, especially all of you in industry, the Army has taken several steps to get the word out on Ada and obviously, we're interested primarily in our own internal training. But we have developed a curricula of courses, a series of 15 or so courses, on several different tracks -- a track for manager, a track for programmers, etc. -- and basically the outline of those curricula have been defined and I understand that this week they are test teaching as a critical design review one of those courses and we will continue to do that at a couple-week intervals. Once that information is proofed and through our CDR, that will be made available through the Defense Documentation Service. You're all welcome to that if you want to institute similar courses within your own companies or your own government activities.

In addition to that, there is a video tape which is now in the process of being filmed, which will be released within the Army by the end of the year, and I think to the other Services and probably industry. It's a 40-hour video tape, Introduction to Ada. We also currently have another task which is currently unfunded to develop some computer aided tools for Ada instruction.

So we're attempting to move out on all fronts. The tools, the training. We're trying to make sure our project managers are looking intelligently to see if Ada fits their system. If it

does, they're going to use it; if it doesn't, then we'll have to look at something else.

Can I take a question or two?

Question

Is there any simple document on Ada for a novice programmer or for an experienced programmer who doesn't want to wade through the whole language to learn enough to do relatively simple tasks?

Dr. Mathis

Yes - put my business card slide back up. There are 23 English language textbooks on Ada, and if you write or call our office and tell the receptionist that's what you want, we'll mail you a list of all those available textbooks, some of which are good and some of which are bad.

Question

I've heard mention of the fact that you'd like to actually certify Ada programming in the future. Where is that going?

Dr. Mathis

Jim and I go to a lot of meetings together. The major thing that we're interested in is that when contractors bid on doing a project and say that they're going to use Ada, we'd like to know that they have true Ada capabilities in modern software engineering practices. The problem is that the current programmer tests, like the CCP and so on, have not really been shown to have any relevance to good performance in programming tasks and what we're trying to do is now go around to some of the educators that we work with and some contractors and ask if there are measures or things that we could do to separate a good course from a bad course, to evaluate the level of training and the level of experience that programmers have. I think it's a mutual concern; we're trying to do something about it, but that's one of the topics that might really be most useful at the end of the session, because that's what this conference is about, I think.

Question

One thing that I don't quite understand -- if we want to use Ada now, you said a moment ago that there's very little hardware that has it implemented. So how can we get ready to get rolling with Ada on January 1?

Mr. Hess

I anticipate that we have quite a learning curve to go through on the use of Ada. One of the things that industry should be doing now, as well as the Government people, is getting smart and getting prepared. I don't see very many systems coming out of the starting blocks in 84 that are going to be ready to use Ada. I think it's going to take us some time. But we can't continue to put our heads in the sand and pretend that Ada is not going to be here, because it is and there's going to come a time when you submit that waiver to use another language when it's going to be denied. At the present time, unless you're using one of those systems where we have a compiler targeted to Ada, the chances are you'll get a waiver. Now, whether OSD will continue to approve those or not, maybe I should let Bob answer.

Question -- (Cannot be heard)

Mr. Hess

I hope what I said is that at the time you prepare your CRMP for Milestone I, you identify the target machine or the criteria you're going to use to select the target machine. I think I said that, but if I didn't, I intended to say that. That, I think, is doable at Milestone I and basically, when you submit your update to the CRMP at Milestone II, then you would identify the specific system you're going to use. That's the same way we do business in the embedded world. At Milestone I, very few systems would be able to define precisely what the target machine is going to be.

Question

Do you plan on requiring contractors to use Ada as a design language?

Mr. Hess

Yes.

Question

Sir, how are you going to address the problem of interfacing with the user's operating system? One of the things we're used to doing is building relatively hard . . . computer data general base cell on a . . . based system that have some very sophisticated operating systems in their task messages, etc. It doesn't seem that Ada addresses this issue at all, and the portability is going to go out the window if you don't.

Mr. Hess

One of the actions that the Army has underway, assuming that our military computer family goes -- and once again, I'm concentrating on the embedded world -- is we are developing our own operating system, multi-level secure operating system that will run on that machine. That's one of the ways that we're addressing it, as far as how do we get from the development environment into the field. Somebody else wanted to jump in --

Question

Yes - being from Gould CSD, we currently have Ada projects underway and expect to have a validated compiler sometime around 3-84. We are specifically addressing the problems of generating code for target real time systems and for computers without any operating systems -- bare machines, essentially. Actually, we see the co-generated bare machines as the real approach for the simulator people, considering the time constraints involved in simulator work.

Mr. Hess

I see that I'm about to get the hook. Thank you very much. I'll be around if anyone has any other questions.

Dr. Mathis

Thank you.

Let me mention something that Ginny mentioned, and that was the kit and kitty effort -- our KAPS interface team, which has been working to develop some standards in the Ada programming support environment area and the most important of those is the common APSE interface set, which is now out for public review. We're also intending in the near future to establish -- I hate to say establish because we haven't really decided what the format will be -- but a similar effort building on the work that the Army has begun with the MCFOS -- their operating system, because the Navy also wants to go to a standard real time operating system and we need to make sure that we're coordinated in that area. We're going to be working to try and address some of the same issues that you raised.

The next speaker is Major Dave Hammond, who is now on the Air Staff, and he has this great title here -- Acquisition Management Policy Analyst. I think that's a great title. Dave has a long career in the Air Force, having worked at RADC on projects with the space shuttle program, with the advanced location strike system, and at Air Force Systems Command, having had a variety of different experiences in the management of mission critical software. He comes with a unique perspective which has been very

valuable in our overall planning for the introduction of Ada into the Air Force.

Major David A. Hammond

Thank you, Bob.

Before I get started I want to mention that I'm on the Air Staff now, but this is an Air Force Systems Command briefing. The material that I'm going to present is in Systems Command policy now, signed by General Bond in late September, and when I say "I" or "we" or "us," I'm referring to Systems Command, not the Air Force as a whole.

There are two basic areas that I want to talk about. One is our four-phase introduction strategy that we've been working on for about two years, which we think is the logical, methodical way of introducing Ada as rapidly as we can without taking too many irresponsible risks. As I say, we've been working on that strategy for about two years.

The other topic that I want to talk about is our risk management approach, which is the way that we think we can do systems in Ada when we're told to before we think Ada is really ready. This topic got its genesis on June 10, 1983.

We have to remember in introducing Ada that Ada is very important to the Air Force and to Air Force Systems Command and introducing it is very important. But it's not the primary mission of Systems Command. The primary mission of Systems Command is to develop those systems that the operational forces need so that they can give the operational forces of other countries the opportunity to give their lives for their country. We have to make sure that whatever we do to introduce Ada does not unjustifiably jeopardize those developments. So what we've come up with is a strategy for stepping through phases where each one of those phases we have successively more riding on the success of Ada. In other words, we start out crawling and then we walk and then finally we run.

For each of those phases, we have some expected results which help focus what we're going to do in those phases and those expected results, of course, feed into the next phase. We also have a set of criteria for deciding when we're ready to move in a given application area from one phase to another. In the interest of time, I'm not going to cover either of those, the expected results or the criteria, in a great deal of detail, but I can answer questions on them later, if necessary.

Phase one, which is really the only phase that we have projects going on right now, is laboratory developments and

explorations, and we have both kinds of activities going on at most of our major laboratories. By development, we mean the development of compilers and the other tools that are necessary for developing systems in Ada; by explorations, we mean in the given application areas that we expect to use Ada, figuring out what are the best system architectures, the best coding practices, the best design practices, so that we have some basis of at least -- I shouldn't say theoretical, but less than practical experience so we're not starting out blind the first time we try to develop a real system in Ada.

Phase two is a somewhat unique system. I've never seen phase two type activities, to any substantial extent, in any previous language introduction. What it comes from is a realization primarily from our JOVIAL experience, that moving a language from the laboratory environment to the product division environment is a much bigger step and much more difficult step than we ever realized. The laboratories can play with tools that are somewhat finicky and fragile. They can produce systems that are somewhat finicky and fragile, and when things go wrong, they say, "hey, neat -- we have a technical challenge. We can go do something fun." Product divisions don't look at problems that way. They look at problems as exactly what they are -- they're problems. They're going to impact your schedule or drive you off your cost baseline, and we have to give them practice at solving those problems when it doesn't count and with immature tools before we force them to do it when it does count and there's an operational system in jeopardy.

So we have the two objectives of transitioning Ada to the product divisions and gaining that experience. Our method for doing this is to pick out suitable systems that the product divisions are developing in some mature language; pick out manageable subsystems of that -- I'm primarily talking in terms of cost -- and do a parallel development of those subsystems in Ada, just as if you were developing a real operational system and who knows -- we might get lucky and actually use some of that Ada code. But that's not the objective; the objective is to get experience for us and experience for our contractors, develop some cost and schedule estimation baselines, things like that.

It's a little bit difficult to sell this, because to do it, we have to admit to the Congress and the public that we have enough money that we can afford to do something twice. But I think people are gradually seeing the importance of doing this. We would have saved ourselves a lot of grief inJOVIAL if we had done it.

Phase three is where we first start using Ada in anger, in the sense that we're developing real systems that have cost goals they have to meet and, most importantly, schedules that

they have to meet. We wouldn't be building these systems if the operational forces didn't need them.

Obviously, we're going to be ready to use Ada on some systems before we're ready to use it on others. Even though it's designed for large systems, we'll probably be ready to use it on relatively small systems first. You've heard the dearth of compilers right now, in terms of targeting to real machines that we're likely to build systems out of. Well, those aren't going to all appear at one time. They're going to appear one by one by one, so as tools and compilers start to appear for some suitable machines, those systems that are using those machines are obvious early candidates for Ada. The main objective, of course, is to get Ada systems out into the field, start using it for real and start picking up some of its benefits.

Of course, this is the military, so at some point we have to make things mandatory. We're not quite as bad as the Army; their philosophy is that anything that's not mandatory is prohibited. We are going to let people use Ada before we make it mandatory. The obvious goal is to achieve the benefits of Ada standardization, and the obvious way to do it -- change the regulations. The thing that is not so obvious is to recognize up front that Ada will never be suitable for all systems, and we have to set up waiver criteria and waiver processing mechanisms in place before we do that. That was another of the things we learned from JOVIAL. We didn't have good waiver processing established, we didn't have a grandfather clause, and in the first couple of months that JOVIAL was mandatory, we got about 100 waiver requests. We destroyed the credibility of the program to a large extent.

Here comes risk management. Risk management is what we do when we're not allowed to do what I just talked about. We clearly recognize that for some systems and some classes of systems, that's exactly what's going to happen. We're going to get told to use Ada, or for some reason we may choose to tell ourselves to use Ada, before we've gone through all those steps. One obvious class is the DOD major systems, the DSARC and AFSARC systems; we've already been told we're going to use it on 1 July 84.

There are three approaches, two of which are actually using Ada and the third one is the obvious out of a waiver. To be able to do that and still control the risk, and what we're doing is basically trading cost and schedule -- cost all the time and schedule when we're allowed to -- to control that risk. I'll cover them in order of increasing expense.

The accelerated maturity approach is a recognition that if you're developing tools for specific application -- you know,

just the editor I need on this program, just the co-generator I need on this program. You ought to have a validated compiler; you've got to implement all of the Ada language, but parts of it that you're not going to use you sure don't have to do a very good job of implementing.

If you're going for specific programs like that you can probably get the tools done faster. And that's exactly what we're going to do. We're going to have the program fund and schedule up front to do a very rapid, sub-optimizing job of developing tools. It may be a waste of money in the long run, but it may be a good idea in the short run and we're talking about short run things here -- to get those capabilities developed and then pick up on the main software development. It requires some funding increase; how much depends on what shape the tools are in at the point the program has to pick it up -- I guess somewhere, generally, from $2 million to $25 million additional cost on the program. That's a lot of money, but on a DOD major program, it's down in the noise. I hope there aren't any taxpayers in the room when I say that.

The one thing that this approach does require, though, is very considerable schedule flexibility. You're probably going to be adding about three years to the program right up front, and in addition to that three years you're adding to the program, you've also got to have some additional flexibility left over because things aren't going to go right, or at least there's a good chance that they won't. So we'll use this approach on the ones that we can, but we certainly don't expect to be able to use it on too many. That's where we get to the second method.

The second method is duplicate development. What we're doing here is we're telling two separate design teams, working for the same contractor so they can talk to each other as changes to the system requirements come along; one of them does the software development in mature language and the other one presses on with Ada, regardless. They're using what tools they have available, they're scrambling to develop other tools as best they can, both trying to meet the original schedule. We keep doing that until we have a clear winner -- clear winner in the case of Ada is the program manager gets the warm feeling that he's willing to stake his career on turning the other effort off. A clear winner in the mature language area is that you've picked up enough experience that you can justify a waiver. And we don't plan to give waivers easily. So the potential here is that we will double the cost. I don't think that will ever happen, but there's always the potential of doubling the cost. On the other hand, you meet the schedule and you produce the system that you're trying to produce. This, by the way, has been done before on the B-1A program back in the early 70s. The design team had just come off the SHRAM, which they had done in assembly

language, and all of a sudden somebody came down and said, "Thou shalt do it in JOVIAL." They said, "You can't do that kind of a program in a higher order language. isn't designed for that -- we can't do it." So we said we're going to do it in parallel. Fourteen months later we decided we were going to turn out a JOVIAL airplane. So there's a chance that Ada will win a good number of these competitions, even though it doesn't look like it up front. It also proves that you can get the funding to do that kind of work when it's important enough.

(Due to technical difficulties, the closing remarks by Mr. Hess and the beginning of remarks by Dr. Mathis were not recorded.

Dr. Mathis

. . . he wants to prove, and the first step is always to divide the theorum into two parts. You remember all these things about discontinuous functions and all that stuff we all studied; well, the basic structure of that is we'll divide the problem into two parts -- an easy part and a hard part. As the instructor, I'll do the easy part in class and assign the hard part as a homework assignment. What I'm trying to do with the Ada program -- what we're all trying to do -- is say let's take the easy stuff, make it standard, and make it really easy so it is cost effective and can be done well, and then we can devote our real attention to the tough things. That's what happening, I think, in an awful lot of programs. We're wasting a lot of our energy on just duplicate effort, things that have been done before, that we don't need the assembly language for the performance at that stage, but we spend all our energy there and then when it comes to the tough part where we really do need the performance, we're sort of worn out.

I'm going to leave that and introduce Bob Schwing. You know, this is a good panel because we have two more Bobs on this panel. You can't go wrong with that kind of an association.

Bob Schwing is the chief engineer on the B-1 simulation program. He's been involved with Singer for some time, having previously worked with the B-52 program, and before that he was a civil service employee with the U.S. Air Force at Wright-Patterson Air Force Base, and has all those normal high quality credentials.

Mr. Robert L. Schwing

What Bob didn't mention is that he gave me the tough homework.

Believe it or not, these slides were all made disjoinly -- not mine, I hope, but I mean each one of the panel members -- and we're all going to come back, I think, to the same areas.

First of all, let me make it clear, I want to get down to brass tacks here. We're talking about the simulator industry. I'm not talking about the Ada language anymore, and implementation plans and things like that. I'm talking about some real activity. Then I have to talk a make believe world of simulation.

We want to talk about Ada as a language; Ada, the environment; and I think something that's been missed -- Ada, the philosophy. Remember that the language really isn't the crux of the problem here. It's the philosophy behind Ada. Let me give you an example. One of the prime ideas behind Ada, as I have seen it from my side, was the philosophy of a standardized, top-down, structured computer programming language. Neat ideas. I venture to say that we can't come up with a standard among the people in these rooms for top-down, structured programming, even if we reference one text book. So I wonder how that's going to be applied.

Let me digress a little bit and you'll see where I'm coming from. First of all, in general the experience has been that for very specialized applications, much like real time simulation, in years past we had customized languages. Why did we do that? We did it to optimize to meet the requirements. I'll come back to that, because I think meeting the requirements is the essence of the problem. We also know from experience that it takes about three years -- depending on who you talk to; some will say five, ten, never -- but at least three years for a new language to work out the bugs for some kind of maturity. And that normally, compilers are optimized for a specific operating system that has been optimized for a specific machine. Why not? And if you question that, remember the so-called standard FORTRAN language? Write one and run it on whoever's machine. Take advantage, of course, of all their extensions they allow you in their FORTRAN plus whatever, because now you have the best efficiency. And take that standard language and run it on brand X, Y, or Z and see what happens. Obviously, it's not so transportable. Again, back into the philosophy -- standard language, portability, and so on.

Now, if we take it a step further, what do we need for modern, modern -- I'll emphasize it again -- modern up-to-date software development? No matter what, we in the industry need support for that language from the beginning of the project to the end. And that's not the end of the project; it's the end of the life cycle. As an example, we talk about a 15 or 20

year life cycle. I venture to say that that's actually longer than that. In the case of the B-52 weapon system trainer, the idea was conceived somewhere around 1974 or 1975 in the Air Force's eyes. The contractor started working on a prototype program, contract was issued in 1977. In 1980 the production program was issued. 1986 was the projected final delivery of the last production unit, and all of a sudden, ten years had gone and we just started the life cycle. Add 15 years to that and obviously we have 25. How many computer systems are in existence 10 years after they're introduced by the computer vendor? So the machine changes, the operating system changes, the technology changes. Somewhere along the line, lo and behold, the language compilers change. We now have optimizing FORTRAN compilers, and so on.

More importantly, the software development activity must contain and be able to relate all the relative information that's floating around in the software development process. How many times have we tried to use the same operating system, but decided we were going to change the compiler? And what happened? Or again, more importantly in the simulator industry, how many times has the computer vendor's operating system had to be changed -- again, had to be changed in order to make the system operate in a real time environment. Now, there's an update to the operating system -- and again, I'll give the B-52 as an example. What do you do when you have a half million lines of code and your compiler gets changed on you? Who absorbs the cost? And more importantly, something that again has come up in modern software development, the language must have, absolutely must have an inherent configuration control capability. We can't have configuration control of software separate from the software development environment itself.

So, what are we talking about? We're talking about an implementation plan. In that implementation plan, the first thing we must address are the requirements. The requirements, not the language. What do we do in real time simulation when we talk about program requirements that talk about 10 to 30 million instructions per second? Where are we going to get a system like that? We can all have Cray machines or Star computers, or we can have 10 or 15 super minis, which everybody, I think, has seen in parallel, and that introduces its own problem. What do we do when we talk about iteration times at 20-50 Hz? What do we do about requirements where we say the software program is actually external interrupt driven? Can we talk about a language capability or do we talk about the requirements? So again, I get back to we have to look at the philosophy and the philosophy must address those requirements first.

After we do that, we have to be sure that the environment is available. What happens if it's not? All the good

intentions for software development go astray. We knew what we were going to do had the environment been available. Whatever the excuses, though, the software development process will be extended.

Finally, we get to the language. Remember that if we talk about Ada, Ada talks about modern software development. Top-down, structured programming. Program design language. The entire philosophy into one. Now, that's not to say we have a lot of problems. I think we've got some possible approaches. One -- and I was very interested to hear the comments earlier about GFE and the language -- if I, as a simulator industry manufacturer, am going to have GFE on the language, why not GFE me, the operating system? Why not GFE me, the compiler? And if you're going to go that far, GFE me, the computers. And, oh, by the way, the software development tools to work all that; the software development tools to make sure I can debug the system. And I put it out to all you government people, because I know we've all lived the same life, do you want to get involved in that kind of contractual commitment? You don't have to answer in public -- just keep it in your head.

The second idea is for the contractors to sit back and just wait -- wait until Ada is proven. Wait until there is a competition out there and now we have the Harrises, the Perkin-Elmers, the DECs, and everybody else and everybody is going to have a certified Ada compiler; everybody is going to have a ". . . Ada environment support capability;" everybody is going to be able to take care of this and then we'll be there. But I think we've heard a few words this morning saying we can't wait. I go back to an editorial I saw two years ago. The sub-headlining under the editorial -- and incidentally, this was in a software trade journal -- "Ada Lovelace - never saw a modern computer - and the Ada language won't either."

Now, the advantage is that everyone here has been set up. Because we know we are going to see Ada. How are we going to do that? I really believe the last bullet on the slide is the one we have to talk about, and that is we have to do this jointly, rationally, and we're going to share the learning experience. Oh, by the way, the parentheses -- and the expense. With every learning experience, there is some expense.

What do I suggest? First of all, and again I mention these were made up independent of everybody else, very logical, cautious, phased implementation, but tied to very measurable milestones, not dates. I'll re-emphasize that -- not dates. The milestones. Make sure each of those phases has a toll gate; that we are not going to blindly go on once the start gun goes off because, remember, we are going to share the experience and the cost. Let's make sure we know where we're going. And I

venture to say, the last point is most important for the simulator industry -- that the toll gate is actually made up of a review panel comprised of the Services, the simulator industry, and the computer vendor. I am not proposing that the simulator industry dictate the growth of Ada in its world; I'm not proposing, nor would I like to allow possible, the government system to dictate the use of Ada in the industry. I don't think the two together can make that decision, because in fact, without the computer vendor, we're all going to look kind of funny saying this is the greatest language in the world and it won't work on a computer.

So I offer this up as a solution, but the solution is only a plan to start implementation. The real solution is what evolves out of that plan.

Thank you.

Dr. Mathis

Thank you. I see this sort of multi-faceted Ada program going on and it's my job to push wherever I can, and I really welcome this kind of a conference because I think we're meeting and addressing an audience here that is somewhat different than we've addressed before with the Ada program. Although I want everyone to rush into it as fast as they can, I am a believer in realism, so I do want to have everybody cooperating and setting those milestones and then, as we set the milestones, let me push and let me do the things that I can do in our office to make those milestones happen as soon as they can. Setting calendar dates sometimes helps, sometimes doesn't, but I can do things to make things happen faster or slower.

Question -- (Cannot be understood)

Dr. Mathis

That's why they put microphones on the table, Bob, so you can answer that question.

Mr. Schwing

I don't think I'm going to reanswer it; I think I'd like to extrapolate on it a little bit, and that is basically if DOD at any level would like to see a simulator program where the operating language is Ada, the reality is if we start today, assuming the language were real, assuming the environment were available, assuming that the computer were available that would meet the requirements of real time simulation, the earliest you would see it in the field is three years.

Dr. Mathis

The main reason we're talking about these things is to push and to keep things going. Over the last year, I think you've all seen a large number of companies and programs announce Ada intentions that you might not have been expecting. I think we're going to see more and more of that. Now is the time when people can be getting together and talking about accelerating the use of Ada and planning for its use and introducing products, preparing to bid on projects, and so on. Three or four years from now will be too late to be doing that. I don't really expect to see Ada on airplanes or Ada in the battlefield probably any faster than you do, but if I don't keep pushing, it won't be fast enough.

The last speaker is another Bob -- Bob Bergman, who is from Gould/SEL, and he also had lunch with me and we were talking about something that I want to share and maybe you'll understand because it's been coming up in the previous talks. Right now Ada is thought of as an embedded computer systems or weapon systems computer systems language. It is primarily being talked about by computer scientists and so on. I'm not sure that that gives the complete picture because it's my impression that, for example, people who work for aircraft companies, even if they spend all day in front of a keyboard and all they ever do is write computer programs, they don't think of themselves as computer scientists or computer programmers. They think they're aeronautical engineers. And in many ways they're probably right. What I would like to do is somehow get the feeling that Ada is the way that engineers can solve their problems, and I think the message that was coming up before in the previous talk by Bob Schwing was that I would like to have the people in the simulator and training community say, "we have problems and if we work on it and help and coordinate these milestones, then Ada will be the language with which we can solve our problems." I'm not trying to go out and push computer science and so on. Engineers have got engineering problems and they've got to have a language to communicate with computers, and I think that Ada is that language.

So that's what Bob Bergman and I talked about at lunch. He's probably going to say something much more intelligent in his presentation now. He happens to be the Director of Ada Marketing and Planning for Gould. Don't think of him as just a salesman -- he has a strong technical background, a Bachelors Degree from MIT, Masters in Computer Science, has been very involved with Ada and . . . and their use as design languages and local networking and so on. I guess he's responsible for these -- Ada can be used for everything, even scrubbing your back now. Right, Bob?

Mr. Robert L. Bergman

That's correct. Being a member of that illustrious group that occasionally changes an operating system on you, I'm glad I'm here to present Ada because I'm 100 percent behind the Ada program. In fact, of course you know that an operating system is nothing more than a complicated program, and we have about the same software technology as you all do.

What I'd like to do in these short ten minutes is impart the results of a small survey that we did on our simulation customers trying to assess essentially the state of Ada training, understanding and awareness of Ada, particular concerns in the simulation business, and try to give some suggestions for the types of courses that you may have to give to your programming staffs to get up to speed with Ada.

You might say why is Gould interested in Ada? Well, I think as you can see from a brief overview of the company, Gould itself is heavily into computer and electronics business, but in particular, we have about 47 percent of the 32 byte component of the simulation marketplace. Also, 50 percent of our business which is in the real time area is either directly or indirectly related to DOD. We're not particularly interested in losing half of our business all at once. We've seen Ada coming for a long time now and we know that our customers who are in the simulation business are eventually going to have to switch to Ada, so we wanted to assess their retraining requirements and also that we can help them make the transition as smoothly as possible. Of course, we have not ruled out the idea of making money at this.

What did we find out? Some of you are looking around and possibly seeing competitors in the same room wondering if "that guy" has a big jump on you. But it turns out not to be true. Seventy-five percent of all the simulation vendors that we surveyed have not started any formal Ada training at all. Of course, everybody has a steering committee going. Out of those, only 50 percent had any Ada compilers available on premises at all.

So, for the most part, what we're saying is that nobody has really started any serious Ada training. As far as the engineering staff, what we see is maybe 25 percent of the engineering staffs are computer scientists, possibly, with reasonable exposure to languages like Pascal, data abstraction, some software engineering concepts, but for the most part, 75 percent of the staffs are essentially engineers from another discipline. What does this mean? It means these are the same people that just, maybe, some years ago made the transition from assembly line Fortran and now have to make another switch to Ada. This switch may or may not be easy because it also involves learning some new software engineering concepts.

In terms of languages used, we found that 90 percent of the applicational languages used are FORTRAN, and that means there is a large body of code already written in FORTRAN that will have to make some transition to Ada.

Another aspect of the survey was to see what the expectations were in terms of ramp-up of training, and this, I think, is very interesting. The curve that represents Star training is basically the statistics I heard from our customers. Basically, what that means is that some time in mid-84, what I heard was that 20 percent of the staff or some small cadre of people would essentially be trained in Ada, and that would increase so that by 1985, there would be around 40 or 50 percent, and sometime mid-86, over 50 or 60 percent. However, I think what was not included in those statistics is the amount of time it's going to take to train a programmer to be competent enough to use Ada in a simulation system. Our own statistics show that that's probably going to take at a minimum, a year -- about six months to learn the language and another six months to relearn how to squeeze every cycle out of the machine in Ada, which is what the simulation people do. So that by 1985, mid-1985, we're really only going to see about 20 percent of the staffs really competent in Ada and you can see the way the curve goes from there. I think what that says is we had better start now and look at training people in Ada.

Why is the simulation business a little different? Why is it going to take a year to train people in Ada? Maybe that's not a large figure, but for the most part -- and I think what some of the concerns I've heard so far -- are the time constraints in simulators. Not only does the simulator control dynamics, it also generates a model. So this is my oversimplified view of a simulator to try to point out some of the hot spots. But in effect, simulators have frame times, they take sensory input, they satisfy some equations of state, some variables, and then they output some information that controls visual, mechanical, electrical things. That time, which includes hundreds of sensory inputs and lots of differential equations, happens, on the average, in 33 milliseconds. That doesn't leave a lot of time for context switching overhead or waste of time in handling interrupts. That also means the code has to be pretty good. So what this does, in terms of Ada training, is it adds on this component; they're not only learning a language, but learning how to use the language effectively enough to handle this kind of real time situation.

What we looked at was, because of the breakdown of the engineering staffs, we tried to see what kind of courses our customers would have to use or give to their people to make them reasonably competent in Ada. Of course, these are not

necessarily in the order they have to be given, but considering the problems, this is the general breakdown.

(1) we call Introduction to APS, which is essentially the programming tools that are in the environment that people will use to design, develop, manage their programming efforts.

Introduction to Basic Ada is a course essentially involving sequential Ada, but introducing concepts of data abstraction, user-defined types, generics, operator overloading, things like that.

A course in real time Ada programming, paying particular attention to tasking and machine-dependent features of Ada, with lots of examples that are germane to the specific application domain that the programmers are going to find themselves in. People become good at programming in a certain area. They learn all sorts of tricks -- some are possibly categorized as bad habits -- but they learn them so that they can meet the requirements of their jobs. They're going to have to relearn how to do that in Ada, and it would pay to spend some time with examples that make sense to those people.

The last aspect of training, in particular the languages, numerical programming in Ada, which is going to be a little different because of the large amount of numerical programming that goes on. Trainers are going to have to pay particular attention to fixed point data types, arranging of real numbers, things like that, and possibly a different approach to algorithms in Ada. And always keep in mind that there's a glorious -- well, more or less glorious vision that eventually we can have standard software components that will reduce the amount of time that people have to spend programming by virtue of the fact that the code already exists. If it's usable and usable in a reasonable way, you can reduce the cost of programming.

The last one has to do with software engineering in Ada, and this may, in fact, be the first course you want to give. But again, alluding to what Bob Schwing said, there is a methodology that's important. Just raising the level of the language to include software engineering ideas does not mean that your programmers are going to use these ideas. It's very important -- you can take a FORTRAN program and compile it with an Ada compiler with very little effort. It does not mean that's a good Ada program. Again, what's important is the philosophy of doing work; to get the full benefit of Ada we have to raise the level of the programmer somewhat to understand some new software engineering concepts.

On the management side, I think this training is critical. Again, software engineering for managers to understand these new ideas, project management in Ada, which will, of course, be

different than project management now in FORTRAN. Ada has concepts of packages; it has an idea that lots of programmers are going to be working on the same program; and the management problems are going to be a little bit different.

The last one is how to bid a contract in Ada. This is very interesting. What I've been hearing is that if I'm forced to bid a contract in Ada, I haven't the slightest idea what to say. Maybe I'll multiply the cost by two or three. I think it's important, and this actually can't happen until people get enough experience with Ada, but to go over how to bid contracts and how to manage them with Ada.

That pretty much sums up what I wanted to say. The last thing is more or less a little advertisement. We are definitely in the Ada business. After all, I have to put on my marketing hat for a second. We are offering some Ada training now. We're looking at more extensive programs through third party trainers. We do have a system available for Ada training. The compiler, as I said before, is slated for validation possibly around Q2, Q3 of 1984. Of course, we have lots of considerations in terms of validating it; on N machines and operating systems, this increases the problem quite a bit. But essentially, the system is available for training now and it really essentially affords a low risk because it's a general purpose computer; it's not specific for training. You can use it for any application and it's working well and available to people interested in starting training now.

Are there any questions?

Question -- (Cannot be heard)

Mr. Bergman

Well, it depends what the total affect is that you want. If you have large life cycle costs now because your FORTRAN programs are too complicated and too large, moving it over to Ada in that form will result essentially in the same problem. The only effort I know of a mechanical approach is some person at the University of Bath in England who has the beginnings of a FORTRAN-to-Ada translater. The only problem with that is you'll have to live with mechanically generated code which may or may not be very readable.

Question -- (Cannot be heard)

Mr. Bergman

My understanding is that maybe 90 percent of it is written in Ada and is portable across environments.

Mr. Hess

Let me speak for the Army for the ALS. In fact, a very large percentage of the ALS is all the tools that reside as part of the ALS are written in Ada. There are some in the area of run-time support that are coded in . . . but 90 percent are coded in Ada.

Dr. Mathis

I was going to make one comment about the FORTRAN question. For those of you who aren't familiar technically with Ada, it has a strong derivation from . . .-60 and PASCAL, but for an old FORTRAN-er like myself, there were lots of things you had to give up when you went over into the PASCAL environment, and I think that Ada gives you a good blending of those. Some of the packaging concepts -- you get back things like common, rather than just all global data. So in many ways, it's much easier to hand-translate a program from FORTRAN into Ada than it ever would have been to translate it into PASCAL. Not that I'm encouraging you to do that.

Question -- (Cannot be heard)

Dr. Mathis

That's a natural lead-in. I'm supposed to speak for Owen McOmber for a little bit about the Navy's plans, and so I'm going to answer the question, if you'll give me about 30 seconds for a lead-in.

The Navy is very strongly committed toward building on the Army's ALS work. I think that shows a good example of real tri-Service cooperation. The Navy, in their development of CMS-2 compilers, has been very strongly in favor of this central management of the compiler and the support system and GFEing it on contracts. So a lot of our GFEing of the Ada environments is directly related to that kind of thing from the Navy. The Navy's ALSN, however, is not being developed nearly as fast as they would like it to be developed. So the Navy has also decided that they're going to use Ada. It would be nice if we had the ALSN here, but we're going to use Ada. Now I'm coming to the question. It's very much like I think a lot of you are saying -- we wish there were Ada for this or we wish there were Ada for that, but we're going to use Ada and that's the kind of thing that people are going to be deciding on contracts. In particular, the SUBACTS program, which is a rather large -- you know, I talk now like all the other Washington people; a billion here, a billion there, and pretty soon you're talking about real money. The SUBACTS program has a software budget in the basic phase of that of over $100 million, and they're expecting to re-use an awful lot of

existing CMS-2 program money. So, $100 million -- isn't that real money? I don't know how big your programs get. Anyway, they've got a plan with IBM to use Ada on that project. There isn't any Ada compiler for the UYK-44, which is one of the computers they're going to use there. There isn't any validated computer for the Motorola-6800, which is another computer they're going to use on that project. But there are other programming languages available, like CMS-2 for the 44, and so on, so IBM developed a plan which I think is a very nice variant of the kind of thing that Dave Hammond was briefing. They've used Ada as a design language in designing the system, and they have a coding schedule which basically begins with beginning to do the coding about mid-84. They've been working closely with TELESOFT to develop an Ada compiler, and they've set requirements for themselves at various stages. When it has it be validated, when it has to meet certain kinds of performance specifications. Due to the overall design of the system, they can go with Ada as soon as it meets their requirements on these particular systems. For example, if, on June 1st when they're ready to start coding in module-1 or whatever they call it, if Ada has met the requirements they have then, they'll use Ada; if not, that module will be coded in CMS-2. If, on July 1 when they're supposed to start coding their second big module, they have Ada ready and meeting their specifications, they're going to be using Ada for that; otherwise, it will be CMS-2. So they have a plan where they have set criteria for themselves, they're developing a compiler, but they're setting those toll gates that Bob Schwing mentioned of "we're not going to use Ada on this project until we've passed over that confidence threshold." To make a decision today and say nine months from now we're definitely going to be coding this in Ada, come hell or high water, that's a premature decision. It's just as bad to make a premature decision to use Ada as it is to make a premature decision not to use Ada. So the SUBACTS has a very carefully laid out plan of what their criteria are and when they can start using Ada so that they'll use it as appropriate. I think this is a model that's going to be followed by a lot of other projects that want to use Ada more rapidly and let me point out the features again. It was Ada as a PDL, a program design language, and then criteria for using Ada at the phases with a definite back-up -- there's no schedule slip on this. If Ada is not ready on June 1 for those projects, they've got CMS-2 that's already ready. This is the kind of thing that I think we're going to see in some other big projects with criteria laid out and if we've got the Ada capability we're looking for on October 1st or November 1st, fine; otherwise, we have our fall-back to go with our JOVIAL compiler or our FORTRAN compiler.

Does that answer your question? The other thing is that right now, not a lot of projects are requiring Ada as the implementation language. They're going for a stage in advanced

development where they want Ada as a PDL, and there are a number of Ada PDL processors and people are working on those. In other cases, people are working on lab systems or experimental systems that fall outside all of this waiver process we're talking about. In a lot of those places, people will be proposing to use Ada as more of an experiment because the schedule is -- it's not like we intend to put this out in the field on a particular day. We're doing the laboratory kind of development, concept-proving kind of thing.

My watch says we've got 20 seconds, but I'll stick around for a little while to answer questions.

Question

I'd like to come back on one point that was made earlier and this is related to the taking of existing FORTRAN programs and being effectively able to reprogram it as a coding exercise into Ada. . . . . When you cut through the sort of smoke screen there about Ada itself being a solution to the objectives of the Ada language, since Ada was set up to reduce the whole life cycle cost of the . . . and a whole bunch of other things, what we're being confronted with is the situation where Ada in itself will not achieve those goals because it's been injecting too much flexibility. Therefore, shouldn't the primary . . . as far as education and telling people involved with Ada not be directly involved with getting people to program Ada but to get everybody onboard with the system's software design and the software engineering techniques. We've got to get in there before you actually effectively cut a line of code because it's at that stage that the objectives of the Ada regime have to be achieved. If you don't do those things, it doesn't matter . . . it's going to be a whole waste of time.

Dr. Mathis

Some interesting points. Let me make two comments. First, I look at our overall objective as introducing modern software engineering practices into DOD, and Ada is serving primarily as the focus so that we get to come and talk and say use modern software engineering. The other thing is about the design of the language, Bob Schwing was talking about analyzing your requirements and so on -- well, Ada has had the most detailed requirements analysis -- probably magnitudes more than any other language. And there are features of the language which I don't like. I'll be perfectly frank about that. But in every case, I can find a specific requirement in the steelman requirements that dictates a feature like that one, exactly that feature, or one that's even worse, from my standpoint. So you pay the price. If you do requirements analysis and say that this is what it has to

meet, then you have to take what you get. Some of those things that people object to, related to shared variables and go-tos and things like that, there are specific requirements that those things be in the language.

Question

I think the point I was trying to go back to was you used the words "focus on Ada" as the way to get software engineering techniques into play. So far as you're talking to management, and the people who are actually going to influence the situation in companies as getting the right things done, getting the focus around the word Ada and saying that if a manager says, "What are we programming in?" and is answered, "Oh, we're programming in Ada," and the manager says, "Oh, well and good," then you've . . . the message.

Dr. Mathis

Those courses that Bob Bergman was outlining, I thought those three for managers on how to bid a contract in Ada, Ada for managers, and software engineering for managers, those are things that we need to have. I agree with that.

Question -- (Cannot be heard)

Dr. Mathis

Let me mention about the courses. Jim Hess mentioned a really substantial Army effort to develop some curricula materials that are available through our office. The Army developed a curriculum and included courses for managers on software engineering and what made managing and programming with Ada different. I think a good idea is a good idea and I'm glad that Bob Bergman brought it up, but we've also got that idea in an Army-developed curriculum which we can share with you.

Question

Major Hammond mentioned something that kind of bothers me, and that is that using Ada that's maybe not yet validated satisfies some requirements.

Major Hammond

No, no, I didn't say that. What I actually said was that you have to implement the entire language in your compiler, in your run-time system, but you don't have to make the quality of the generated code, for example, as good for those features that you're not going to use as you do for the ones you are going to use. For example, if you've got a system that is not

going to use tasking, and contrary to most of the Ada community, I think that's the majority of the systems, or at least I hope it is, that do not use dynamic tasking, you don't have to do a very good job of that kind of a context switch.

Question

But it seems to me that the real pay-off of Ada is that it . . . a language that's complete. And already we're starting to see Ada subsets - - -

Major Hammond

No -- not legally called Ada.

Panel Member

But Dave is right in this, and I've been stressing with the 1750-A community, that an Ada compiler that meets Avionics requirements will have different performance characteristics than an Ada compiler that's intended for data base manipulation and command and control kinds of things. It's entirely conceivable, in fact, that we'd have on an airplane two 1750s, both programmed in Ada, and have been processed through two different compilers because they gave different real-time execution performance to the resulting programs.

Major Hammond

For example, Ada -- if you read through the Ada manual -- the idea of dynamic memory management just comes roaring through, and that usually implies garbage collection. A lot of applications require that. A lot of applications -- and I suspect yours -- can't stand that, so you have a compiler that fakes dynamic memory allocation by statically allocating a whole ton of memory. In a ground based system, maybe you can afford to do that but you can't afford to take the time, the unpredictable time, for garbage collection. The compilers are going to be different for different application areas, and the run-time systems are going to be different for different application areas and if you focus only on the one you care about, chances are you can develop a compiler faster than you can develop a compiler that's acceptable for everybody. I suspect you can never develop a compiler that's acceptable for everybody.

They have to be validated compilers and I don't want to leave the impression that I'm advocating the use of non-validated compilers. I'm probably the strongest voice in the Air Force for using only validated compilers.

Question

Already I'm starting to see Ada variants on the market. I thought that was not going to be allowed -- variants for micro . . .

Dr. Mathis

The products being advertised by Supersoft and R&R Software are not in conformance with the standard, and I continually write them letters telling them they are not in conformance with the standard, and I don't want to stand up here and try to defend what they're doing.

Question

That's strictly against the principles?

Dr. Mathis

Yes, but I'm not going to sue them. R&R Software is a couple of guys in Madison, Wisconsin -- I'm not going to sic the Justice Department on those poor guys, but they are not doing Ada. There are at least 30 or 40 worldwide efforts that have not yet produced validated compilers. They all intend to produce validated compilers in the very near future, and as soon as we get over the threshold that more of the people are talking about validated compilers than unvalidated compilers, then I'll start going around and chomping on the other people. But at the moment, it's our general wish to have as many Ada implementations as possible, as soon as possible, and tying up their valuable time with law suits is not the way to accomplish that at the moment, although we have lots of lawyers who won't talk to their lawyers, either.

Question

Could you say something about the difference between the Ada Program Office and STARS? Are you part of the STARS?

Dr. Mathis

Is there a difference? You know, there are four or five different functions and sometimes we wear one hat and sometimes we wear another hat. The STARS program is, I think, built on the Ada program, complements it, naturally. We're trying to get separate funding through Congress for that because the Ada program is one program. The STARS program is a much larger program to bring other aspects of modern software engineering practices to DOD. It involves a lot of work with the personnel system, overall contracting mechanisms, lots of other things besides

just a programming language and its programming support environment. So it's all the same people, the same actors, but we've got one job and that's to get Ada going as fast as we can. The second job is what we're trying to do with the STARS program.

Major Hammond

Let me elaborate on that a little bit. Within all three Services the STARS program manager is either the same individual or sits right next to the Ada program manager in that Service. So in fact, there are two programs, two different program elements building on each other done by essentially the same people. It's the same thing at OSD.

Question

I don't understand what's embedded software and what's not.

Dr. Mathis

Embedded software is like what's in a microwave oven or an automobile.

Question

The training equipment, for example, we supply, under contract, operating systems as part of the deliverable. Does that mean we would have to get a waiver if the operating system were not . . . in Ada or the data compiler were not . . . in Ada? Is it every piece of deliverable software that has to be in Ada or you need a waiver, or there are some pieces of deliverable which are embedded and which are not embedded. How is that defined?

Major Hammond

We get into a problem here of words and their meanings. Basically, back a couple of years ago, the Services talked about embedded computer resources because that was a term we all thought we understood, and basically we were talking about the software that went into the computers that were embedded into the weapon system itself. Recently we've come out with the new policy, and the new policy talks about mission-critical computer resources. Mission-critical computer resources is a broader area than embedded systems. It includes such things as trainers, simulators, stimulators, testing devices, and, in fact, the operating systems can be construed as mission-critical computer resources. So, in fact, yes, if you take the broadest look at that policy you're talking about all of the above fall under what is called MCCR -- mission-critical computer resources. And that's the policy that Dr. DeLauer sent out on June 10th, that all MCCR will use Ada.

Question

Every piece of deliverable software will use Ada?

Dr. Mathis

Let me add something to that so that you don't have a heart attack. There are some words in 5000.31 that talk about use of off-the-shelf commercially-available software.

Major Hammond

There are also some very specific words that talk about software use for logistics that are not considered mission critical. You'd really have to get either the legislation itself or get the OSD implementation where they list the specific criteria of what's considered mission critical and what isn't.

Question

Can you give me a few examples?

Dr. Mathis

I'll give you one way of looking at it. For example, if you're building a system on top of a standard, commercially-available operating system, I don't think anybody would hassle you if that operating system was not written in Ada.

Question

Would you have to seek a waiver?

Dr. Mathis

I don't think so. I'm shooting from the hip, but I don't think so. If you were developing a unique operating system as part of that development, and especially in those cases where it's difficult to distinguish the application code from the operating system code, then I think yes, you would have to either do it Ada or get a waiver.

Ms. Caster

That's the same thing as the way we work in FORTRAN right now. In our contracts we'll tell you yes, you have to have FORTRAN in your training equipment, but we don't go back to SEL and . . . and FERRIS and tell them to write their operating systems in FORTRAN, because that's previously developed. I'm talking about the developed software that you're doing this contract in.

Question

Anything that is critical and is deliverable has to be done in Ada. Is that correct? I don't understand what . . . is critical in the first place.

Dr. Mathis

Let me sort of cut this and interject here. The revised 5000.31 will apply to all software acquired from the Department of Defense and it's our general thrust in that to take advantage of developments in the industry so that if there commercially-available software, if there are commercial operating systems, things that we can buy rights to and use without having to pay again for their development, we want to do that because that's cost effective. On the other hand, if there's something unique being developed for us which we intend to maintain over a long life cycle, we want to buy that in a way that we can maintain it in as cost effective a manner as possible. So Ada is going to be our primary thrust there. If, on the other hand, it's possible to come back and say writing this in C and . . and going to this and that and so on -- if you can convince us that that's the way that this particular system is most cost-effectively managed, that's the kind of stuff you put in a waiver. I'm not expecting 100 percent or even 99-33/100th percent to be in Ada, but we're expecting that for the overall life cycle cost effectiveness, we're going to see most of our software in Ada.

Major Hammond

It's probably time for me to give my standard speech which I almost always end up giving at these types of things, and that's from the implications of the questions I'm getting the idea that people view waivers as negative things, that you don't want to ask for a waiver because it's going to be a black mark on the program manager's record. In most cases, a well thought out waiver request is a mark of good management, not bad management, and don't be reluctant to ask for a waiver if going with something other than what we're asking for makes more sense. I probably shouldn't admit this, but the two years I was at Systems Command and processing language waivers, I think I had 100 percent acceptance rate. I know I did on the ones I passed up to Air Staff. I never had one turned down that I approved. And I don't recall ever disapproving one that was sent up to me by one of the computer resource . . . points. I slowed some down sometimes, made them go back and do their homework more, but I think they were all ultimately approved.

Dr. Mathis

I'll echo what Dave was saying, but I also want to mention on the other hand, if you're bidding on a contract and Bidder A

says, "We can do it cost effectively in Ada," and you come in and say, "We're going to have to ask for a waiver," your reasons better be awfully strong because the other guy has got the presumption on his side, because we're pushing Ada. You're going to have to sell it not only to the program manager, but you're going to have to make a case strong enough to counter that other bidder's claim that he can do it in Ada. We're pushing Ada but we also have to be realistic.

Question

But it's also especially difficult if you don't understand the definition of mission critical software to know whether you've got a chance.

Dr. Mathis

Let me say that, although mission critical is a word that exists in law through the Warner Amendment and is primarily differentiated in how the system is procured, whether it's through procurement for mission critical or it's procurement under the Brooks Act, that's the primary difference and the reason these words are used. The revised 5000.31 is going to apply across the board, all of DOD, all systems required by DOD for any purpose along the lines I said, that we want to take advantage of commercially-available systems but we also want to say if we're developing something unique and we're paying for its development and we're the users and so on, Ada is going to be the presumptive best language unless you show otherwise.

Major Hammond

We probably ought to add something else, too, and that's that when you're bidding on a system, there's one guy you're trying to satisfy and that's the source selection authority and after you win you're trying to satisfy the program manager. You respond to what's in the Statement of Work and chances are it's going to tell you specifically what parts of the system have to be in Ada and which ones don't. It's only the program manager who has to worry about what's in 5000.31 and 800.14 and 300.10 and all those things. Now, if he decides to seek a waiver, he's going to ask you for some of the ammunition, obviously. But you have to respond to the Statement of Work, primarily.

Question

I think you just answered the question I was going to ask. The thing that I'm concerned about, I don't want to get caught as a contractor between your organization and the person who's putting out the RFP. If the RFP does not specify Ada, I don't

want to later get caught in the cross-fire. Can we be pretty well assured that when the RFP comes out and specifies language, that will be the final word?

Ms. Caster

We are required by the same regulations to use FORTRAN . .

Dr. Mathis

That's the overall management of the procurement in the writing of the RFP and the Statement of Work and at what stage the computer resource management plans have to be approved.

Question -- (Cannot be heard)

Dr. Mathis

But remember that I work for a very large company. Through the Services and through their management of procurement -- like the rest of OSD, I try to micromanage, but I don't -- if you haven't worked in OSD and at the headquarters, you don't maybe understand that. But the Services procure and they write RFPs, and it's not our place to go down and try to micromanage projects. That's what SPOs are for. But on the other hand, if the Services grant waivers they shouldn't be granting, that's the reason that OSD is in the review loop and it's primarily going to be "don't do that again and if you do do it, we'll cut off your whole budget" and all that. They get the message.

Question

Can you tell me what provisions have been made or what funding has been set aside to help procurement activities . . .

Major Hammond

In our plan we couldn't address how to do that. All we could address was how to figure out how to do that and we pinned the rose on Systems Command ALR -- I could do this because I knew I was leaving -- to put together the Air Force's training requirements and education requirements, distinguishing between the two, and get those inputs from all of the Commands because Systems Command is not the only Command that procures systems; it's just the major one. And then task Air Training Command, Air Force Institute of Technology -- identify commercial courses, things like that. But we haven't taken it any farther than that yet.

Dr. Mathis

We do have a big advantage. The Colonel who replaced Dave's previous boss is Ken . . . who used to teach at the Defense

Systems Management College, and taught the systems acquisition course. That's one of our big resources to get it out. But you're absolutely right; we've been addressing that problem. It's just how do we get everybody to jump all at once.

Question

Major Hammond, I notice the Army and the Navy kept words about GFEing their product. What's the Air Force position on that?

Major Hammond

Bob put out a bunch of basically horrible things to think about and said are you willing to take on all that contractual responsibility that goes along with GFEing that stuff, and then he said you don't have to answer it in public. As soon as he said that, I leaned over to Jim and said, "I've answered it in public many, many times and I will again." Any part of the Air Force that I speak for is not willing to take on that contractual responsibility. We do not plan, as a matter of policy, to GFE that kind of stuff. That does not mean that individual programs can't choose to, but there will be no Air Force-wide policy mandating that we GFE that stuff. We will try to educate our contracting officers and our program managers so that they realize what they're getting into when they choose to do that.

Mr. Hess

Let me comment on that from the Army point of view, because in fact, we do plan to provide the ALS as GFE. We've also gone a step further, as Bob has suggested on one of the slides -- I'm not sure if that's what he intended -- but we are in the mode of sharing with industry to the extent that we're inviting them to take the ALS that we have, to move it to their machines, and then to market that. So there are options to the ALS that is GFE'd by the Government and we are developing some certification tests now that those can, in fact, be used on Army programs.

Major Hammond

Let me add one more thing to the answer I gave which I always forget to give and it comes back and bites me. A lot of people don't realize exactly what GFE means. Obviously, Bob does. I hope most of you do, but I've run into a lot of audiences where they don't. A lot of people think GFE means we give it to you free. And I'm not saying that we're going to refuse to do that. But we are going to refuse to GFE, in most cases, in the full legal sense of GFEing. In other words, we

direct you to use it, we give it to you, we take responsibility for its performance. If you pick it up out of the Federal Software Exchange or something like that and on your own choose to use it and tell us how you're going to support it, we're not going to refuse to let you use it, in most cases. But the key point is it's your choice to use it; it's not GFE that we force on you.

Dr. Mathis

Let me sort of amplify. I think one of the things that's coming through clearly from all the Services is that the Government-developed software environments and tools, we want to make available for people to use. We'd really like to have, with industry, a new model for how to manage that because the traditional GFE model that the Navy has had is unsatisfactory to the Air Force and the diversity of environments without government support is a model that's not quite workable, either. We need some middle ground where commercial people and contractors can use our environments, use the software that we've paid for, but not lock us into the fact that the Government has only this one mechanism named GFEing. So if you have some questions there, or comments, that's something that we're open on to dialogue because we paid for these and we want to have everybody take advantage of them. On the other hand, we can't allow the kind of diversity that we would have with 40 different environments.

Question -- (Cannot be heard)

Major Hammond

What I meant by that is that we plan to step through those four phases because we think they are necessary to reach a broad applicability of Ada. We recognize that some programs will be required to use Ada before we have been able to step through those four phases in that particular area, and in those cases, this is how we will do it. I also should have mentioned that at no time can you say the Air Force, as a whole, is in one phase or another because it's tied to particular tools and it's tied to particular application areas. We may, for example, choose to extend Dr. DeLauer's mandate; right now it only applies to major systems -- DSARC and AFSARC. We may choose to pick out some application areas and say even for smaller systems, Ada is mandatory before we make it mandatory across the board. I would hope that we would probably do that.

Question -- (Cannot be heard)

Major Hammond

I don't want to answer that, but I will give credit to where those phases came from. Most of you in the room, I think,

know Colonel Ted Ackerland from the SIMSPO. There aren't any of his words in that plan, but I worked for him for two years and I learned an awful lot from him. Another place where they came from, in addition to all the computer resource focal points and the people in the SPOs, is that we have had a continuing dialogue for two years with primarily the Ada-JOVIAL users group, where we have learned what goes wrong. The very first Ada-JOVIAL users group that I went to -- I had been on the job for about a week -- I got up there to brief 25 April 1981 RD&LE letter out of the Air Staff that says use Ada when sufficiently mature, and I was immediately asked the question are we going to use the same definition of maturity for Ada that we used for JOVIAL J-73. So I got a lot of feedback from those people and they deserve the credit for it.

Question

I love that, and I'm glad they got the credit, but I, as a . . . person, the person who is responsible for the marketing or procurement of Ada-based procurement, I personally would like to have the protection of your . . .

Major Hammond

On small programs you still have it.

Question

What's a small program?

Major Hammond

Less than DSARC or AFSARC. What the Navy is doing, I don't know. I've been accused of speaking for the Army before -- let's not get all three Services mad at me.

Question -- (Cannot be heard)

Major Hammond

Some of the phase two work, the parallel development of a part of the system in Ada, we are hoping to be able to fund some of that work from some of the "basket" sources of money, but there are some 6.4 programs that are definitely intended for technology transition -- 6.4, 7.4.0 computer management, resource management technology program is one and there are some others. We're hoping to be able to get some of that money to be able to fund these parallel developments. Captain Larry Sweeney at Hq, AFSC/ALR is the SYSTO for that, and Lt Col Frank Rosso at the Air Staff is the PEM. There's no promise that we are going

to be able to get substantial money there, but that's one of the places we're looking.

Dr. Mathis

In a number of individual Navy programs, I know Ada studies have been done as a way of getting contractors to begin to come up to speed and justify some training, but at the moment that's being done on a very individual basis in particular contracts and through particular programs. But we do have a number of people who are jumping on the Ada bandwagon. I hate to really say it this way, but there are enough volunteers that we don't have to pay anybody.

Question -- (Cannot be heard)

Dr. Mathis

Amen. I've been down there and visited Dr. McKay, who runs that program. And they're jumping up all over. Yesterday at Jersey City State College in New Jersey, there was a discussion of some of the stuff the Army has funded; here in Virginia, California. It's everywhere -- it's creeping -- it's taking over. But that's the way an awful lot of people are doing it, at the local universities and local companies, seminars. Amen. NASA is going Ada. I should have talked about the NASA program. But they're low key -- they only shoot stuff up in space.

Comment

I'm from Penn State University. Part of what we're doing is trying to get it into the branch campus system to start teaching it. It's not easy until we get the top data compiler that we can start putting up on our VAX.

Dr. Mathis

If you've got a VAX 11780 with three or four meg memory you can use as a personal computer, Ada is your thing. I think one of the comments about maturity of the language and so on, we've had to push for the validated Ada compilers first because we wanted to have that done. But I agree that in the next couple of years, we need to have a university-oriented training type compiler, which Ada Ed is not, that can be effectively used. I've now decided it should either be called What Ada, after the What-4 and What-5, or maybe Ada-C, after PLC. But you can all interact on that.

Question

I've got one more question about training and maybe this goes back to the same issue, but it's one thing to teach the use of the language . . . but what I'm concerned about is what about the compiler specification itself? I hear a lot of things about the . . . that the language has to go through before it's certified, but is it strictly language consideration . . . . or does it also include a number of . . . on the compiler .. .

Major Hammond

Let me mention something about validation. Our current validation effort is only to test conformance to the language standard. Performance is not an issue at all. Now, we do have, under Ginny Cast r, a task for environment evaluation and validation to extend those concepts. Through our Validation Office we also are extending into performance measures and the evaluation criteria that are probably a lot more relevant to most of you, namely run-time performance of compilers. Those are things that we're moving into so that we'll have some central testing resources. Whether we do that testing or not is still a question, but we are moving into exactly the areas you're talking about.

Question -- (Cannot be heard)

Mr. Hess

I don't know about the other Services, but I've looked at the list of programs that this mandatory direction of Ada on 1 July 1984 applies to, and there are only 12 programs and I don't recall any of them being simulator programs. So you don't have to be that concerned right now about writing waivers. You do have to be concerned about getting ready for using Ada.

Dr. Mathis

We've gone a long time over this session, but that's what we're here for -- to answer some questions. Let me thank the panel members: the two at the end, the two Bobs -- any panel that starts with a Bob and ends with two Bobs has got to be a good panel. I thank you both for coming and bringing us some perspective from Gould and from Singer/Link. Then Ginny -- Ginny didn't get to talk much about E&V task, but that's an important new thrust we've got, so I want to have you talk to her. And thanks to Jim Hess and Dave Hammond who always do a good job presenting for their Services. And thanks to Karen for setting it up and Bob for turning some overheads. Thanks again to all of you.

USER PANEL

CONTRACTOR SUPPORT OF TRAINING EQUIPMENT

Mr. Bernie Netzer

Good afternoon. My name is Bernie Netzer and I'm moderator of this panel. I know a lot of the people in this room. I guess I've been around longer than I need to be. To give a little background to those of you who don't know me, I'm an EE, I've worked in training devices since back in the 50s, so I've been around them a while. I work for NTEC in the Field Logistics Support -- almost 20 years in my present job, so I've been involved in that for some time. Probably I'm a little older than most of the members of the panel, but we have a very distinguished panel here. The members of the panel will be stating their opinions on many things concerning COMS. They in no way are setting policies for any of the Services or for their companies. So if they say something that is controversial, that's their opinion. I just want to make that clear so nobody feels as though there's anything being done other than that.

To give you an idea how we're going to run it, I feel that we don't need to really discuss the pros and cons of contractor support. It is fact for some of the Services now, and may or may not be fact for the other Services. That's something they have to decide. But if we assume that both the contractor and the Government have one goal that is common, and that goal is operational training equipment that can be used by the Services, and I think that's a good assumption, then the only thing that really puts us in any position of disagreement is the cost, because the contractor, naturally, will seek to maximize profits and the Government will seek to minimize costs. So I think there's plenty of room for lots of discussion between those two extremes.

I have asked each of the members of the panel to prepare a short, brief five minutes or so, and the members of the four Services to tell you where their Services are at the present time and what they may know about where they are headed. The three members from industry have been asked to give us some idea of what their companies are doing, where they are headed, or where they would like to head. We'll use about five minutes per panel member, roughly, for this discussion and then we have six topic questions that I will broach to the panel, call on one member of the panel to start the discussion, open it up to the panel for discussion. Then it will be open for discussion with the audience. We do ask that you do stay in line with that particular subject at that particular time so that we don't

stray off course. Probably we will have to call time on some of the discussions when they are just getting interesting, if we're going to get through all six or even come close to it. So with those ground rules in mind, we'll start the introductions.

The first panelist I want to introduce is Eddie Baker. He is with NTEC. Eddie is head of the COMS group -- Contractor Operation and Maintenance Group -- at Orlando. He is involved in contracting for contractor support, both within the surface Navy and the air Navy at the present time. Eddie has been in simulators for quite a while, almost as long as I have, so he has a lot of experience. He came to NTEC in 1965 and has worked with them in one capacity or another since that time. Eddie received his initial training in the Army with additional training at the University of Pittsburgh School of Engineering.

Mr. Edward Baker

Thanks, Bernie. The Navy owns over $1 billion of . . . training equipment that is located throughout the United States. These devices are under the custody of a fleet organization such as AIRLANT, TRALANT, AIRPAC, TRAPAC, and the Naval Reserve. The trainers play a vital role in the Fleet's training program. Since there is a low population of any particular trainer in the Navy's inventory, support of this equipment has been difficult, at best. Traditionally, the Navy has utilized an enlisted rate called the TRADEVMAN to operate and maintain these training devices. On 18 June 1982, Secretary of the Navy issued a memorandum that disestablished that rate. It was determined at that time to utilize contractors to replace those operator and maintenance functions that were performed by the TDs to support aviation and surface trainers. The Naval Air Systems Command, AIR-413, and the Chief of Naval Education and Training were tasked to develop and budget for the Navy's initial contractor operation and maintenance of simulators program. NAVAIR and CNET, in turn, tasked Naval Training Equipment Center as the contracting agency for this effort. We are fully committed to apply our resources of personnel and facilities to execute the entire spectrum of contractor operation and maintenance support of this training equipment.

Phase out of the TDs assigned to the aviation trainers is to occur over a five-year period -- fiscal 84 through fiscal 88. Phase out of the TDs assigned to surface trainers is to occur during fiscal 85 and 86. At the present time, there are no plans to include the subsurface trainers in the COMS program.

Contracts for aviation trainers will be awarded by Weapons System, where all trainers supporting that weapons system, regardless of location, will be included in a single contract.

Contracts for surface trainers will be awarded under what we call a base master concept, where all trainers located on a particular base or in a school will be awarded in a single contract. It is intended to award one-year contract with four option years. Although the Navy has had various trainers supported by contractor personnel in the past, the initial aviation COMS contracts, using the COMS philosophy, were awarded during fiscal 83 and will continue through 88. Contracts for surface trainers are contemplated for the latter part of fiscal 84 and continue through 86. This effort will place all COG-20 trainers currently identified as COMS candidates under contract. The schedule is an ambitious one and places a heavy burden on both the contractor and government resources.

In order to standardize our approach, we've developed a generic statement of work that we will use as a basis for all of our COMS contracts. This should make the contractors' tasks of responding to our request for technical proposals easier and, of course, from a selfish point of view, it makes our evaluation of those proposals easier.

The Navy has included in the COMS program innovations such as an on-site preproposal conference that the user hosts, and a mobilization period after contract award to permit contractors to provide the best possible proposal and to allow for a period of time to organize their work force prior to assuming the operation and maintenance of the training equipment.

Our goal in the COMS program is to provide a smooth transition from organic to contractor maintenance, and to provide fully operational equipment to meet the Fleet's training requirements. As we formulated our program, we interfaced with personnel from the Army, the Air Force, Coast Guard, and members of industry. We feel we have developed and implemented a program that will meet our objectives and the responses that we have received from industry replying to the request for technical proposals that we have released to date has been gratifying and we welcome feedback in order to improve our COMS program in the Navy.

Thank you.

Mr. Netzer

Thank you, Eddie.

Next I'd like to introduce Al Behler. Al represents the Marine Corps. Al has been a worker in training devices since he joined the Marine Corps in 1961, so he has a considerable number of years' experience in simulators. He got his initial

training at Duquesne University. He is currently Department Head of the Simulated Systems Department, Director of Training, Commander of Marine Corps Air Force Base and is responsible for the operation and maintenance of all simulators, air and ground, at Marine Corps Station, Cherry Point, and maintaining matters concerning simulated systems at Cherry Point, New River, and Marine Corps Station, Buford, as Advisor to the Director of Training. Al started out in the Marine Corps as the equivalent of the Navy TRADEVMAN in the Marines, so I think that Al is well qualified to speak for the Marines' position, at least as far as the operation and maintenance of simulators.

Mr. Al Behler

Thank you, Bernie. Whether the white in my beard and hair indicate it, I am not as old as Bernie.

In 1973, the Marine Corps made the decision to replace their training device technicians. As some of you know, the Marine Corps and the Navy are rather closely tied together, so at that point in time, where prior to that the Navy TRADEVMAN school was where Marine Corps training device personnel received their training, so we went to school with the Navy and we worked on essentially Navy devices, since the Navy owns the device and the Marine Corps manages that device. As Bernie indicated, my training was as a Navy Training Device Technician. In 1973, when the Marine Corps did away with their Training Device Technicians, there were about 203 of them in the Marine Corps, so we were not a very large group. The decision to do away with them and replace them with Civil Service technicians has worked extremely well. Presently, we have, I believe, about 178 working in the Marine Corps, supporting both ground and aviation training devices.

The big question that many people have is is the panel loaded. I can assure you that the panel is not loaded. I'm one of the people who all you gentlemen and ladies are talking about replacing. Since I am a Civil Service employee employed by the Marine Corps in the maintenance of this, my comments are kind of split between my heart and my head. As a manager of training equipment, I have to take a long, hard look at the management of training devices and the most effective way to perform my mission. From my heart, I'd just as soon not be out of work in the COMS area. But what I try and do is try and remember, as I wish each and every one of you, be you contractor, government, Service-oriented, would do in any of these discussions: way down at the end of this pipeline, not the multi-million dollar corporation but way at the end of the pipeline, there's a young gentleman or a young lady who straps this weapon system on and goes somewhere with it. That is the ultimate thing that we must worry about. So how we accomplish that, be it internal or whether it be contract

maintenance, the Marine Corps will, at this stage of the game, look at all their programs on a one-by-one basis to determine the most effective way to manage that program. But please remember that the end result is somebody using that system.

Thank you.

Mr. Netzer

Thank you, Al.

We have Lou Sucich, who represents the Army. Lou is presently Chief of Logistics Management for the Army's Project Manager for Training Devices. In this capacity, he is responsible for management, coordination, and integration of all actions pertaining to logistics support of all PM TRADE projects. He is responsible for support of all PM TRADE life cycle managed items, which include several CLS, or contractor logistic support contracts. Lou has a degree in Business Administration from Southern Illinois University, and a Masters in Management from Rollins College. He is a graduate of the Army Maintenance Management Intern Center. He has worked for various Army activities in both line and staff assignments for the last 15 years. I believe you'll find Lou also qualified to sit as a member of this panel.

Mr. Lou Sucich

With the exception of flight simulators, which went under contractor logistics support in 1972, all of our other training devices in the past have been supported through the Directorate of Industrial Operations at each post, camp, and station in the Army. These people were not dedicated training device specialists; they were not identified as training device specialists, although they were DA civilians. Because of the fact that they were not dedicated to training devices, it was not their primary duty. It was another "duty as assigned." And also the fact that over the years, resources were cut, training devices received very low priority in getting fixed. This was okay in the past because training devices were very small in quantity, there was no structured training program that depended on training devices. Training devices were just out there and if they were available at the time, then they would be used sometimes or not. There was no schedule for their use. Also, they were very simple in nature in the sense that you didn't require any specialties. If you had an electronic mechanic, he could generally repair whatever you had with very little training. However, in 1978, with the operational test 2 of the multiple integrated laser engagement system, MILES, it became apparent that the current system of supporting training devices was lacking. Because training devices were becoming much more complex, they were becoming greater in quantity, and they were widely distributed. This created the

need to establish contractor logistic support as a concept for supporting more than just the flight simulators.

The Department of Army Material Readiness Command established a joint work group to look into this area to determine just how we wanted to go about, in the Army, supporting training devices and contractor logistics supported training devices. Just very recently, a Department of Army regulation was approved by the Deputy Chief of Staff for Logistics, and is currently in publication. This established contractor logistic support as the preferred concept for support of training devices. However, in doing this, it stated that in the requirements development phase, which would be prior to full-scale engineering development contracts, an analysis should be done to determine whether contractor logistic support or in-house support for each specific training device is the method to use. Such things in the analysis to be considered were economics, but more important than that was administrative and support workload, availability of in-house TMDE, availability of in-house personnel and skills, distribution and quantity of trainers procured, impact on military organic capability for support of mission essential equipment, risk of commercial or military obsolescence, design stability, and probability that the contractor would be around for the life cycle or a contractor to do that work. This regulation also stated that where contractor logistic support was determined to be the method to use, minimum but sufficient technical documentation and data should be acquired for life cycle competition of contractor logistic support. It also established DARCOM as a central manager when a training device is located at more than one location. It stated that maintenance and supply functions would not be dictated to the contractor above operator level. In other words, to try and use the contractor's existing commercial practices and standards; do not dictate the military way of doing business as far as the levels of maintenance and what should be done at each level. In this same line, a separate budget line is to be established for contractor logistic support so we don't have to get into the accounting of whether it is retail or wholesale support.

This basically was the step that we were waiting for in the Army to give us a structured way, a way that we don't just dive into something without thinking about it, a way of supporting training devices. It also gave us a method of supporting training devices. With that, we have now ten training devices under contractor logistic support and we have in the planning stages of items we currently have in development, another fifteen. And we are well on our way and it looks like contractor logistic support within the Army is the way to go on, I would say, 99 percent of the training devices that we'll be developing.

Mr. Netzer

Thank you, Lou.

Dick Manning represents the Air Force. Dick is currently the Air Force Logistics Manager for development and implementation of contractor logistic support procedures for the EF-111A OFT, which will enter the Air Force inventory in 1986. Dick has 23 years of experience in the management field, 20 years of that time in logistics management of various systems on the F/RF-4 aircraft. The past three years have been confined to logistic support of the F/FB/EF-111 operational flight trainers and the B-52 weapon system trainer.

Mr. Richard Manning

The Air Force is being confronted with two critical problems in achieving the maintenance and repair capability required to support modern weapon systems. First, the tight defense budget and escalating development costs of high technology hardware and software limits the funds for acquisition of new system support. Second, the sophistication of the new systems increases the demand for the technical skills of maintenance personnel.

As a result of manpower reviews and increasing attention of the revised Office of Management and Budget Circular A-76, support by contract is receiving increased emphasis. Should the determination be made that the air crew training device career field is not military-essential, phase-out of this career field will occur as part of the military manpower realignment and will be replaced by contractor support or organic civilian support. If the air crew training device career field is to be phased out, we must do some planning now to provide for the financial aspects of conversion to contractor support. The Air Force must develop plans for turning over workload of existing organic devices to contractor support or justify retention of organic Civil Service.

There are two separate aspects to the contract support planning effort. One deals with in-service systems; the other with acquisition systems. For acquisition systems, we need to determine how to support the system before we buy it. Since there will be no military organic capability and if we can assume that the user cannot show Civil Service to be more advantageous, our choice is fairly simple. We go contract. For a system in acquisition, the type of logistic support selected will be a cost driver. We must decide how much data, spares, and support equipment to buy for competitive contractor support. Our position is that the Government must own sufficient spares, data, and support equipment to ensure that contractors other than the manufacturer can compete. This ownership must be handled so that the contractor is not relieved of the availability requirements established by the user.

Regarding the in-service systems, an orderly method must be devised for converting to contractor support. We must identify budget requirements as soon as possible. We must decide on the contracting method. Since a depot level maintenance already exists, it need not change greatly. The burden of change will fall on the O&I level, and thus on the using command. Definitions need to be watched so that logical, economical funding decisions are made. Innovative and creative thinking is required, along with new regulatory guidance to prevent confusion in oncoming systems.

In summation, we believe that contractor support will work in a competitive environment. Our transition will be aided by up-front planning. The financial aspects of contract support will represent an unknown at the present time, and therefore, budgetary projections must be based on realistic assessment of costs for training, maintenance, and support. We believe the other Services and contractors can assist us in this area and we welcome the opportunity to exchange ideas with those representatives.

Thank you.

Mr. Netzer

Thank you, Dick.

We've heard now from all four Services. We're going to hear from some representatives from private industry. They are the other half of this equation.

We'll start out with Mr. Doug DePalma from Lorel Electro-Optic Systems. Doug is a graduate Electrical Engineer. He's been in logistic support for approximately 20 years. Doug has been an Air Force officer, he has been a user, he has been associated with support of electronic equipment for a number of years. His company is active in this field at the current time, and Doug will give us an idea of what is going on.

Mr. Douglas DePalma

Thank you, Bernie.

I have several vu-graphs that I'm going to use to illustrate what we're doing at Lorel Electro-Optical Systems with respect to contractor logistic support and how it works into our overall efforts.

I have the charter at Lorel Electro-Optical Systems to provide total product support for all of our products from the beginning of engineering development through field implementation

and the life of the system. This gives us some unique opportunities to synergistically utilize the ILS disciplines. To show you how we do that, I'd like to first talk about the multiple integrated laser engagement system, which is our primary product at this time. We also produce IRCM systems and we also do the optical imaging systems for satellites. For example, the pictures of Saturn that you've seen were done with equipment that we produce at EOS. However, the multiple integrated laser engagement system is our primary product.

What this system does is provide simulation or laser firing, eye-safe laser firing, for all of the family of Army systems.

We've organized systems logistic support so that all of those disciplines that are associated with product support come under one management head. Integrated logistic support does all of those logistics activities that you're familiar with for support of a product, again beginning from engineering development with maintainability and maintenance engineering through field implementation and a system's life cycle. Logistics support analysis, for example, continues to be updated with real world information. The Assets Management and Technical Field Support Departments are there to support the products in the field operation -- contractor logistic support. Assets Management is controlling right now over $30 million of assets that we have scattered at 24 world-wide contractor logistic support maintenance sites. We do this utilizing a computer and telecommunications network that feeds in on a real-time basis daily, weekly, and monthly information on utilization of the equipment, on failure of the equipment, on consumption of the material -- all those things that you need to know in order to manage the material and to predict what is going to be required in the future. The Technical Field Support Department is primarily a laboratory where we train and support the field technicians. We also implement and track all the retrofits, and the retrofits of the equipment are done by the field technicians. We identify and verify problems that are occurring in the field, either with our equipment or customer use of the equipment, and we track those problems until they are resolved. We are also repairing all of the circuit cards that are in the field in our laboratory.

The contractor logistic support effort is divided into four regions. Our sites extend from Camp Casey, Korea, to Seventh Army Training Command in Grafenwohr and . . ., Germany. As you can see, we have an extensive operation to manage

Summarizing some of the highlights of how we are implementing contractor logistic support -- and I will say that this is the first time, for this particular system, that the Army chose contractor logistic support -- total contractor logistic support -- for a system of this size, used everywhere by the

Army. We have regionalized our management so that I have regionalized managers who are hands-on managers; they're not just administrators. They actually do maintenance and they are very familiar with the operation, obviously, within their regions.

The computer and telecommunications network provides us the maintenance actions, equipment, usage, and inventory control that we need and it's all mechanized so that we can call up from the database at any moment specific information on a location or on a particular item of equipment where we want to have visibility, on MTBF, for example.

We're transitioning to a pool inventory system which will automatically replenish the spare parts from two warehouses, one in Pasadena and one in Germany, and additionally, it will trigger the factory for repair parts production automatically.

Finally, we have a centralized intermediate-level circuit card repair activity which I will talk about a little bit later, as one of the subjects that we're going to be discussing. In addition, we found as part of the CLS activity -- and again, we learned this; this wasn't something that happened on day one. It was a matter of a learning process of how we could most effectively implement CLS. We found that so-called sustainment training, or the training of the customer on how to properly operate, install, and use this equipment was essential. In doing that, we have three people at the Armor School and three people at the Infantry School who assist in implementing MILES into the programs of instruction. They also train the controllers on how to do exercises and how to use the controller gun and those aspects of training. But in addition to that, we use our field technicians on a non-interference-with-maintenance basis to supplement that activity. So at all 24 world-wide locations, our maintenance technicians also are available, when they're not doing maintenance, to give this kind of training on a request basis to the customer. On occasion, they are supplemented by the people from either the Armor or Infantry School.

In summary, we have a CLS operation world-wide in place. We're capable of expansion to other products, either extensions of the MILES or new products, for minimal cost. Once a system like this is in operation, it's a minimal cost to add another system to it. We are going to be introducing the air-to-ground engagement system and the air defense system next year, and it will be approximately approximately an 18-month period when that is fielded. So that's another system that we're going to be adding to contractor logistic support, an extension of MILES so that we now have airborne activity together with the ground operations.

Thank you.

Mr. Netzer

Thank you, Doug.

We're running just a little behind. Jerry Purser works for the Link Flight Simulations Division, is responsible for the Flight Simulator Division support contracts for research and development labs, U.S. and foreign military support, division training, and foreign military spares. Jerry has 26 years' experience in the simulator field. During this time, Jerry was the Simulator Complex Manager at the Kennedy Space Center from 1966 through 1969, Director of NASA Simulator Complex contract from 1970 through 1974. The last seven years he has been Director of Support Operations.

Mr. Purser

Thank you.

As a member of the Link Division of the Singer Company and a manufacturer of simulators and development of simulators, our prime interest is availability of those simulators after they have been put in the field and how they're utilized. To do that, over the last seven years we have found ourselves where we had total support, we had interim support, we had a mixed bag of where two contractors would be maintaining a simulator or it would be us and the military maintaining a simulator. To meet the total support requirement, I think a total support contract for availability is the best way to go.

Looking at it that way, you have a contractor who is totally responsible to give you the availability that you desire. Making that contractor responsible for all levels of maintenance, making the contractor responsible to an acceptable configuration control plan or management plan, making the contractor responsible to manage the spares, and to provide the necessary spares to meet the availability is required. We also recommend that that be done under a firm fixed price contract and making the availability be the key issue.

There are several reasons for that. One is if a contractor has total responsibility, it's much easier to develop a team concept that's looking at a goal that says I want that simulator up and I want to make it available and I want to make it the best that I possibly can for the user. If you have a split responsibility, everybody will do their own job, but they will lose sight of the key issue, which is availability. The other thing that I find is of major interest, we don't need to have pilots come to a simulator complex where the complex is not totally up and available for them because they already would rather fly the aircraft, as we all know. What we need is for the pilot to get into the simulator with a positive attitude, saying that this is a good

training device -- and that's what we plan to give you -- and to do that and to give you the best availability on a long-term, life cycle cost. We propose a total support contract with one contractor.

Thank you.

Mr. Netzer

Thank you, Jerry.

Last but not least is Bart Smith from AAI. Bart has an Electrical Engineering degree and he has a Masters Degree in Management. He has a number of years' experience. He is currently Manager of the Maintenance Operations Division, AAI/Engineering Support Incorporated, which is a wholly-owned subsidiary of AAI. The development and management of contract maintenance and operation services comes under Bart with AAI at this time.

Mr. Barton L. Smith

Thank you very much, Bernie, and congratulations for getting through all of that alphabet soup. It is Engineering Support Incorporated, which is the wholly-owned subsidiary of the AAI Corporation. In the past, original equipment manufacturers, including AAI, have sometimes found that their reputations were tarnished on occasion when a fielded system wasn't fully supported and operational to the expectations of the user. That occurred, perhaps, because of the hardware itself or it may have occurred because of the logistic support posture and you heard the Secretary of the Navy refer to that same thing in his address this afternoon with the S-3A. That happened irregardless of whether the logistic support was the particular problem area, had been recommended by the prime and not procured, or for whatever reason. At any rate, the prime contractor, the OEM, his reputation would suffer and that was not pleasant. For those reasons, the AAI Corporation, early in this decade, determined that they would try and correct that problem and in order to do that at the most reasonable cost, to provide those follow-on support services, Engineering Support Incorporated was formulated. When the COMS effort came along, it seemed quite natural to utilize that device and to pass those low costs on to the Services. For that reason, the Maintenance Support Division, which I head, was added to the Engineering Support Incorporated staff, and it is the goal of the Division to bring high quality, results-oriented -- in this case availability -- of simulation and training equipment to the Government for the least possible cost.

Bernie asked me to talk just a little bit about the status of things. I'm not going to deal with all of Engineering Support Incorporated, but just that of the contract maintenance operation,

in which we're interested here. We currently have several ongoing COMS contracts and those contract maintenance operation contracts, and those are both for the Navy and for the Air Force. Within the COMS world, particularly, we have received the award for support of the A-6E. Those devices are located at Naval Air Station, Whidbey Island, and the Naval Air Station, Oceana. In the Air Force, we have several contracts. The latest contract that we received was for operator services in support of the T-45 undergraduate navigation trainer at Mather Air Force Base.

I guess it goes without saying that our future plans are to provide those high quality support services for the Government, whichever arm, and to provide all that we can obtain award for, maintaining high levels of productivity for those contracts.

Mr. DePalma

. . . . . not only has to do the maintenance, but ideally, he's also responsible for manufacturing the repair parts and seeing that the repair parts are in place. He's also responsible for managing those repair parts and finally, in our experience, he should have a certain amount of responsibility to see that the customer is properly using the equipment and not abusing it, that it's stored properly in the warehouse, that it's tagged properly for repair.

The way the Government can monitor the activities effectively of a contractor are tools that the Government already has in place and they don't have to be part of a Statement of Work. For example, where GFE is given to a contractor, the Government has every right to perform audits on a periodic basis, even with consumables and I think it's the Government's responsibility to perform those kinds of audits to see that the contractor is indeed using the property properly. Customer satisfaction, monitoring of the user across the board -- is he satisfied with what the contractor is doing? Is the contractor performing in accordance with those parameters that were established in the Statement of Work? Is the contractor reporting accurately? Easily audited to check to see that the reports that the contractor is submitting periodically are accurate.

Now let me give you just one example of how this kind of freedom can save a lot of money. We're all familiar with the three levels of maintenance where we have at-the-source maintenance, the intermediate level maintenance, and the depot repair and Army maintenance. These are pretty rigidly prescribed. There are regulations that state what will be done at each of these levels and how they will be managed at each of these levels. Under CLS, where the contractor can go ahead and figure out the most effective way of doing maintenance, he can come up with a lot of cost savings. I'll give you the example that I wanted to give you. With respect to the MILES system, the maintenance concept was there would be only I level repair. The LSA, in defining

I level repair, stated that the circuit boards were not repairable items in the field because at 24 locations where you have to maintain bit and piece parts around the world and try to also have certain special equipment at 24 locations around the world to repair circuit cards, it's not cost effective. After about 15 months of operation, we found we had about 4,000 cards out there. Some of them cost $2,500 each. We said, why don't we set up a centralized I level repair that would not require the various kinds of inspection and receiving and other kinds of paperwork control that is required of a depot level repair facility. It also would permit us, in accordance with our technical publications, to test the boards at slightly lower tolerances than would be done at the factory or would be done at a depot, and would also permit us to do it with regular test equipment and not automated test equipment. We have now learned how cost effective this is. We are repairing approximately 200 to 300 circuit boards a month this way that are recovering about $200,000 a month in assets and it's costing us about $50 a board. That's for everything -- for shipping, receiving, repair, the parts, the whole business. So this is an example of how, I think, giving the contractor the leeway to come up with an imaginative solution to maintenance is a big pay-off. The only way you can do that is to limit that Statement of Work to only those essentials of what it is that's expected and not how to do the job.

Thank you.

Question -- (Cannot be heard)

Mr. Netzer

I think that's probably an issue in itself, describing total contractor maintenance.

Mr. DePalma

Well, in our case, we have total responsibility for not only maintenance of the system, but management of the assets, which are GFE'd to us at the factory. What happens is it means that at a given location, when one of the pieces of equipment has failed, it is given to us and what happens beyond that is our responsibility. We must, within a given length of time, give that piece of equipment back to the customer fully operable. And I'm talking about hardware.

Question

That's what I'm confused about on total contract maintenance. We carry total contract maintenance of software and hardware.

Mr. DePalma

We also maintain the software that we use as a management tool to manage the assets. That's also our responsibility.

For developing that software and for maintaining it. But that's a tool that we use and the customer really doesn't see that.

Question

But you separate it. You say your concept of total contractor maintenance is hardware only.

Mr. DePalma

No, that's not true. It's hardware and software. It happens to be that we're hardware intensive. The software that we use is used as a tool.

Mr. Purser

In reference to simulators, if I might -- we look at total support as giving you the availability. We will make the simulator available if it takes working through the software, replacing the hardware, delivering a motion leg from one facility to another, flying a part from one facility to another. We will do that. That's what we talk about as total support. Everything that is required to make that simulator available to you at 8:00 o'clock or 9:00 o'clock, whenever you'll start your mission.

Mr. Sucich

I'd like to add one thing, though, on both of these gentlemen -- in both their Statements of Work in their contract, that the Army maintains configuration control over both the hardware and software at the Level 1 type of engineering changes.

Mr. DePalma

I think that's essential. I think that's the kind of control that is necessary, or otherwise you will not have a data package that you're comfortable with. Class 2 changes we implement through field modifications and, of course, we update the documentation with Class 2 changes, but they do not require approval. Only a Class 1 change has to go through a Configuration Control Board -- military Configuration Control Board.

Panel Member

I agree with Jerry that availability is the bottom line. However, not at any cost. And I disagree with you, Doug, as far as giving you the freedom to do whatever you want after the contract. Our COMS contract, we're asking you up front, when you submit your proposal to tell us how you're going to do all these things. We ask you to provide to us a certain amount of availability. We're going to turn over to you our hardware; we're

going to turn over to you our software, our parts locker, and we're going to ask you how do you propose, in maintaining this hardware, doing the preventive maintenance on the hardware, how do you propose to maintain the baseline on both the software and the hardware that we're providing to you. That's part of our proposal evaluation -- you telling us how you're going to do it. We don't want to lay down to you as to how to do the job, but we want you to tell us up front how you're going to do it.

Mr. DePalma

That's to be expected and I'm not disagreeing with that at all. All I'm stating is that a Statement of Work should not presume to dictate how that job is going to be done. Obviously, the proposal, in justifying the dollars that are there, has to have rationale behind what it is that's being done and there's where you describe how that activity is going to be implemented.

Mr. Sucich

Yes, and that's what I thought Doug was talking about because there's no way you can do it otherwise because you would have no way of evaluating what he's charging you. He in fact could come up with a concept that may not be the most cost effective or economical and if you didn't have some way of evaluating what he is proposing as his concept, you wouldn't be able to evaluate whether it is, in fact, the most cost effective method to the Government.

Question -- (Cannot be heard)

Mr. Sucich

To oppose what Doug said as far as these circuit boards and this innovative thing on circuit boards, part of the history on these circuit boards was missing in his statement, and that was that originally when we went out on MILES for contractor logistic support, the items were considered throw-away items because of the cost of the circuit board at the time and the repair of it at the time. The main reason that the cost to repair these items was not effective as opposed to throw-away, was because when the MILES first went out there it went out there in not necessarily small quantities, but the usage of it was very small. We anticipated a build-up time over time; we anticipated that there may come a time when there would be enough circuit board work to warrant setting up some sort of depot level or general support level of repair of these circuit boards. So what we had done was that we had the posts, camps, or stations, through the MILES representatives on field, store these boards just to keep them in hold until such a time as the demand or the usage or the repair of the faults of these boards was such that it was economically feasible, then, to set up a repair line to repair them. That's what . . . really did.

Mr. Netzer

Let's cut off on that one. We're going to have to move on or we won't get off the first subject.

The next subject is how can the Government verify procured documentation to ensure adequacy to allow open competition or maintenance and operation contracts. Related to this, how can sufficient documentation accuracy be verified to allow modification of trainers, either through open competition or organic means. We've had several comments on this from the audience. I believe, Ed, that you volunteered to start that one.

Mr. Baker

I think that all the Services -- Al didn't mention it specifically, but I'm sure he'll agree -- recognize the need that we have this adequate support documentation and an adequate data support package in order to be able to compete the maintenance of trainers. When we buy one-of-a-kind equipment, it's difficult, at best, and very expensive to verify this documentation. When the Navy had its own resources to maintain the things, we conducted training courses for these personnel and during this training period, we used the preliminary documentation that the contractor submitted. This gave us a good opportunity to take a look at it and verify it. Of course, that's gone now with the disestablishment of the TDs. So the current trend to compete the maintenance contracts at the earliest possible date requires both the Government and industry to produce, validate, and verify the documentation concurrent with the hardware. It looks like what we're going to have to do is to have more involvement by the Fleet Project Team and other government personnel to spend more time and effort in the contractor's plant performing these tasks of verification of the documentation. It's going to be incumbent upon industry to put more effort in the early and accurate development of this material, and, of course, it will be incumbent upon the Government procurement teams to allow time in the schedule to accomplish this task, concurrent with the hardware development.

Panel Member

Let me jump in a second, Ed. We've all discovered in the process of the newer, bigger weapon system simulation that verification of the docume. tation not only is critical, but is one of the most difficult things to do. I won't lay the blame at the contractor; I'll lay it at the amount of documentation that is required for major weapon system simulation projects. Some cases, we found that it has taken us three years to go through each and every manual just from the very nature of the fact of the amount of documentation that must be verified and in some

cases, if the weapon system has been delivered and is in place and is working, and then right away we hang the availability figure on it, it's very difficult to verify this documentation and not affect the availability of the simulator. In the area of maintenance documentation, in some cases it's going to be disassemble something to find out if the documentation will allow you to reassemble it. So if you're verifying documentation, in some cases you're shooting yourself in the foot. It is a very large problem that's going to take very close coordination between industry and government in order to try and solve that problem. I think one of the other problems in documentation verification is in the area of competitive contracts -- we've got to verify in government that in the event that we have to compete or we're going to compete for follow-on contracts for the maintenance of that same system, that the next person or the next bidder on that contract can utilize that documentation to properly maintain that equipment we give him to maintain.

Mr. Netzer

On that same line, let me ask one more question, Jerry, that maybe you might want to answer because this is a question from the audience for a member of private industry. Before deciding to bid a CLS contract, what software/hardware documentation would you see as essential before you bid?

Mr. Purser

I guess the question I was going to ask him was that after you go through all that documentation, do you really find that all of it is necessary for you to be able to maintain the simulator?

Panel Member

No. Let me real quick answer your question. No, you'll find out that after that period of three years, there's probably a great deal of the documentation that may never be required. However, to know that up front is another question. You won't know until you get somewhere into the program whether or not all the documentation that you received is critical for your maintenance effort.

Mr. Purser

What you need to maintain the simulator with contractor maintenance, I don't believe is at the same level as you need for the military. That's not because they, in general, have less expertise. You have some people who have less expertise because they don't have the same number of years working with the equipment; you don't start at the same level as the people

in the industry do. Most of the people in the industry are starting with a large number of people that we get from the military and have been trained by you and are that stage where it really doesn't need to be limited to using a tech order. Also, in reference to earlier statements, the technical data that you restrict him to use takes away a lot of ingenuity and a lot of creative thinking, I think, from the people. I also think that whether or not it's a contractor that has a total responsibility or the military that has total responsibility and the flexibility to be able to perform, is a key issue and I think if you limit either party to working only with a tech order, whether it be the military people, the contractor, or whatever, you take away ingenuity, that freedom to go out and do something to think about how we're going to make this organization better, how we're going to get better utilization. I think to answer the other question, the amount of documentation you need, if you're looking at redesign, modification, or anything of that nature, whatever that documentation level is is as much as a good contractor needs to maintain the simulator. We do not need tech orders, per se. We don't need step-by-step instruction on how to fix something. You give us the schematics, you give us the software listings -- normally in the field, software doesn't fail. Once it's stable, there's a reason if you have to change the software. Software doesn't fail.

Mr. Manning

Let me add just one point to that. We are confronted with documentation now in the EF-111 program -- as I see it, there's another point that I don't think has been mentioned here; the requirement for documentation. It should be adequate for competitive procurement, reprocurement. For another contractor to take that documentation, to review it, to be able to bid on that program. I think that's the issue that we see. We're not concerned as much about the documentation that the contractor is going to use. He's going to use a lot of his own writings. As long as he maintains a 95 percent availability or whatever availability has been established, he'll do so with the documentation that he has. But we want to be sure that we have enough documentation to present to another competing contractor.

Mr. Netzer

Okay, Dick. You kind of walked into another question that I have. Will there be a cost savings to the Government because they will not buy as much documentation and because the Government will not perform the O&MN unless these requirements for some of the documentation -- will that inhibit competition? Will there still be competition by other than the prime?

Mr. Manning

There have been some studies completed by ASD out of Wright-Patterson on that subject. Those studies were confined primarily to the EF-111 program. They did show that there were cost savings. We feel that over the period of time -- and they were using a 15-year period of time -- yes, there was a cost savings.

Mr. Netzer

Here is an interesting one I think we want to take a look at right away. There is a confusion between CLS and COMS. CLS means contractor logistic support, where COMS means contractor operation and maintenance. This question says, concerning both CLS and COMS, both Mr. DePalma and Jerry Purser talked to life type and coordinated support and made sense. The COMS system to the Navy is described by Mr. Baker as at odds with that system and that described by Mr. Sucich. The NTEC implementation of COMS appears unworkable at the Marine Corps survey level and is directly -- who asked that question? Would you like to put it in words?

Question

The statement that I'm making is that we're confusing a number of acronyms up here. CLS is not COMS . . . in any way, shape or form. CLS may make some sense to the air base commander and he might be able to work that system. COMS, on the other hand, is something that he is going to have to ultimately fund. You haven't given him the ability to do that or . . . The real question comes down to while some of the people in the industry appear to be talking CLS -- they're talking, "well, here's my system; I will maintain this for the life . . ." I can understand that, but what we're talking about in terms of implementing CNO directives or SECNAV directions, in COMS it's not that at all, and it places an almost untenable burden on the actual holder of the equipment. I was wondering if NTEC would care to address how they intend to make . . . . or the people who have to prosecute this program smart enough to be able to implement COMS or would the Navy consider perhaps CLS instead of COMS?

Mr. Baker

Well, of course the whole program is very complex. We had the situation of getting trainers that were in the inventory under contract, we had the problem of getting trainers that were currently under contract but not yet delivered, and we had the problem of future trainers. So when we talk about COMS, we do have some variations and we do have Statements of Work. We have a Statement of Work for existing trainers and we have a Statement of Work for new trainers. As far as the problem at hand,

it is replacing the TD that is leaving. As some people like to phrase it, arms and legs. We have the work force leaving and we have to replace that and the sailor did organizational and intermediate maintenance on the devices; he operated and maintained those devices at that level. That's the function that we're reporting. Now, typically, AIRPAC or AIRLANT or . . . were responsible for that. When these TDs worked for them, that came out of their annual appropriation, their O&MN budget, and in order to wrap the thing up and try to get a program going, NAVAIR, in the case of aviation devices, is funding that. They have it in their budget for a finite period, the same as CNET has it in their budget for a finite period. After that finite period, the funding will revert back to the Type Commanders and come under their budget. Now, we didn't dream up the COMS program in a vacuum. We involved the user, NAVAIR, ourselves, other Services in trying to come up with a program. The Type Commanders will have access to all the costs that we have to help them in their budgeting in the out years, and they have had an input to the budgeting that NAVAIR and CNET has come up with for the initial budget.

Mr. DePalma

There are two other acronyms that are often used, too, and I think that all of these things are really facets of the same thing. The Navy also uses CETS and CMS, CETS being Contractor Engineering Technical Services and CMS being Contractor Maintenance Services. Contractor Maintenance Services can, and even right now is being implemented to the extent that on some of the carriers you have contractor personnel who are maintaining radars for the F-18, F-14 for example. That is really contractor maintenance. It just happens to be that you now have a contractor person there doing that job rather than a Navy person. In our view, that is a facet of CLS. Whether you take the whole pie or a part of it is a matter of what the individual requirement happens to be. So I think a lot of these acronyms are being used somewhat loosely. They're all contractor support.

Mr. Baker

No, I don't think they're being used loosely, Doug. Most of the acronyms have a very definite reason for being used because of the type of funding or the particular instruction that we're working under.

Mr. DePalma

But that is a restriction of the military, not of the contractor. I don't care what color money I get.

Mr. Netzer

Okay, let's move on to the next one. Should the Government contract for operation and maintenance by location, which may include devices manufactured by several companies, or by weapon system type, which generally allows greater manufacture specialization?

Mr. Sucich

We are experiencing that we in the Army must come up with some form of consolidation of contractors at posts, camps, or stations. We have realized that a post like Fort Knox, Kentucky, by 1985, will have five different contractors supporting training devices and these five different contractors will be under contract with four different Army material readiness commands. This is only 1985. This is only the start of training devices that are going out there and contractor logistic support for those training devices. I foresee that by 1990, there could be 12, 15, 20 contractors on poor old Fort Knox, getting in each other's way, duplicating a lot of effort, management, facilities, tools, and equipment, plus the fact with the various material readiness commands involved, it would just be like somebody trying to handle four or five puppets when he's only got two hands. So we must look at ways to consolidate this. We in PM TRADE undertook a study that we had conducted by one of our support service contractors. We have the results of that study and we are analyzing it now because we can't rush into anything. But the bottom line is by location is not the answer. We looked at, first of all, regionalization, in other words taking one or more locations and by density hooking them together. But by location, where you have such a thing as a MILES or a flight simulator or something, you may end up, then, with two or three different contractors maintaining the same training device and you really lose the economies of scale because now you have three separate sets of parts for the same training device, three separate laborers. But when we were going through it, we did find three alternatives that are workable alternatives. One of them is a commodity-oriented method which says, the Army has five different commodity commands under their material readiness organization. All of the training devices that fit into their commodity would be under one contract. That way you'd at least keep the training device under one umbrella, but you may have three or four different training devices supported under one contract. The second type of alternative would be a functional grouping. By the way, that commodity grouping reduces to no more than five contractors ever at any one location. Another possibility is functional grouping and this can be debated and looked into further. We divided the functions into three areas, one of the areas being flight or aviation, another area being what we call ranger maneuvers -- something that is actually out in the field, such as a MILES, such as a

target system, and then a third area what we just call composite. These would be institutional type trainers that would be in a classroom, that would neither be aviation nor a ranger maneuver type of thing. This reduces it to three contractors max at any one location. And of course, the last alternative that we're looking into is world-wide, which says one contractor has got the whole ball of wax. In other words, all training devices we throw out there under one contractor. Now, at first that sounds kind of horrifying, and it may be politically not even feasible, because let's face it, the user is satisfied with Singer/Link on their flight simulators and they're happy with availability. They don't want to change horses. The user is satisfied with Lorel on MILES. But we are being forced into competition. We are not going to have any choice about staying with Singer/Link unless Singer/Link can . . . the competition. The same with Lorel. Whether we would be happy to or not is not a question; we must compete. In doing this, then, if we're going to have to compete, then it's just as easy to compete on smaller, more consolidation of devices. Since we may not end up with Singer anyway, why not consolidate. So this is what we're looking into. It isn't a panacea. There are a lot of things to look at. We have to look at the methodology first of all. We have to be sure that on all these training devices, we have sufficient documentation to be competitive. We have to go back in and review what we got. I know we've been talking a lot about documentation, but the one thing on documentation -- nobody can pinpoint what it is -- but when we do reduce the documentation for contractor logistic support, we must be aware that we must not reduce it to such an extent that some other contractor, brand new off the street, cannot come in and support that device. When I talk about documentation it's more than just the manuals or the drawings. We must have some means of having a transition from one contractor to another, to include training or passing on whatever training from one contractor to another, such as the Air Force has in what they call their follow-on training plan. We must have a package of parts. If the Government is not going to buy the parts which will belong to them, but let the contractor do their own thing, we must have in that contract that at the end of that year period or contract period that the parts in the inventory are at full level to support it for another year so a new contractor can come in and take it from there and run with it. These are some of the things we have to look at. We don't know which alternative we're going at. We are exploring it now, but I can tell you we are going to try to sell to our higher headquarters that we must consolidate, at least to reduce these myriad of contractors of onesy-twosy type devices, at least get it down to maybe three or four major contractors that will support everything else.

Question

I'm confused and I think some other people are here, also. The Navy says that their . . . TD rate is disappearing. You guys are talking about Circular A-76 on your side of the table, right?

Mr. Sucich

In my case, no, sir.

Questioner

The Air Force is, right?

Mr. Manning

Right.

Questioner

We're probably confusing this whole issue with contractor support about four initiatives, different drivers. SECNAV says do this, Circular A-76 -- who is directing the Army to go competitive?

Mr. Sucich

The lack of available skills and personnel in an existing system -- we've never had TDs in the Army, so we've had to basically piggy-back onto existing maintenance organizations that neither have the resources to pick up our training devices nor really cared to. That's what's driving us. The fact that we did not have a system . . .

Questioner

Somebody needs to get all these up in one . . . and say, here's the way it's going to go. You're all going to go Circular A-76 or whatever, but you guys have so many balls in the air . . .

Panel Member

Let me just make a comment on that. The A-76 circular, as I understand it, was introduced to have the Government compete with industry on specific items of service, for example, and the kind of support that Lou is talking about is being institutionalized within the Army and it has nothing to do with the Government competing with industry to see who can do it most efficiently. A decision has been made that on certain devices, the Government does not want to even begin to get the capability for support

because on a training device that's not necessary for war, it's there for training. So now you can put your resources where they really should be, which is to fight, and those people who are involved in the training aspects, it just extends your capabilities and it's just a different issue. The A-76 was there to try to compete these various things, whereas CLS, as defined by the Army, is a concept for support of training devices. So there are two different issues there.

Mr. Baker

There are three different issues, really, because the Navy has as the driving force the removal of a particular capability that they had previously. So they cannot really operate under A-76 and survive. There's nothing to compete against.

Mr. Sucich

But I don't think, from what I understand of the Navy, that the Navy and Army are different. It's just that the Army never never did have a support system out there and when we started throwing out --- you know, we're kind of new to the training device business compared to the Navy to begin with, and the other thing with the Army is when the Army has training devices, it's large scale, big quantities just like we do with our more-boats-than-the-Navy-has type of thing. It's large scale, so when we started throwing these large-scale type things out there and these complex things, we did not have a system out there to support it. So we had to look for one. The Army made a decision that rather than trying to establish one, let's utilize contractors who already have established systems and are out there. The Navy is coming up with a similar thing. They are losing, as I understand it, their system -- not by choice, not because that contractor is better, but they need those green-suiters, they need those people to run the combat operations, real operations of the Navy. So they're losing their system and having to go to contractor support to pick up for what they're losing.

Question

How come the Navy and the Army do not come under Circular A-76?

Panel Member

The Army does come under A-76. All of the training aid support centers, for example, at the Army bases are up for competition and in fact, a number of them have already been turned over to contractors.

Panel Member

In the Army, I don't know it was the A-76, but there have been studies -- at least four that I know of -- since 1972 that compares the Civil Service force to contractor and on a cost comparison. I don't know that it necessarily followed A-76 guidelines down the line, but those determinations have been made on a couple of occasions with the Army.

Mr. Sucich

One step further on that, up until the time that the Department of the Army and the Deputy Chief of Staff for Logistics and my commander at DARCOM and different people, as we were working up to go contractor logistics support, up until that time any time you wanted to go contractor logistics support, the way to do it was through the cost comparison analysis between government and contractor. Prior to A-76, it was AR-235-5. During AR 235-5, it was pretty hard for a contractor to ever win a cost comparison analysis. It was weighted towards the Government. A-76 actually took some of that weight away and really put the weight towards the contractor away from the Government because with A-76 and the flavor of the times, actually, with Congress and everything else, it was really trying to put more towards the contractor, to be honest with you, at least in my opinion, than to the Government, anyway. But that really did not become the issue with the Army. In other words, even if A-76 was our document and we had to use it, even if government came out as more cost effective, we did not have government to do it, so basically, when we started doing our studies and came up with this regulation on contractor logistics support of training devices, we just made a determination there were other factors that were more important than cost -- cost was important but there were other factors that really dictated how we go.

Mr. Netzer

Let's move on to the next question. I want to get at least one more before we close. How soon should the Government seek open competition contractors for maintenance and operation of new equipment? Also, should a separate competitive contract be instituted to maintain configuration control and development of software changes, or should this be performed by the OEM or in-house by government versus OEM?

Mr. Smith

I'd like to break this question into two parts, and just address the first one that you started with. I think, particularly in the interest of time, we should do that. That's a key question nowadays that we're all interested in -- how soon

should the Government seek open competition contracts for the maintenance and operation of equipment, and that "how soon" has to do with not tomorrow or the next day, but how soon in the life of the equipment cycle. I'd like to propose some things for your consideration. I think the range of possibilities are from day one, or the day the device is accepted, from the time that all hardware anomalies and software anomalies are removed, or possibly a third, from the time that all logistic elements are in place. I've talked to several people here the last few days that are knowledgeable in this area and I think that the easy answer that I've gotten from most of these people is that the OEM should complete the work-off of all of these anomalies and that's probably going to take a year to two years, and that that's the time that we should change over to a COMS type operation on a competitive basis. But I'd like to ask you a question. Is that the best answer? I think maybe not.

Mr. DePalma

I think under any circumstance that the best place for the data package to be maintained is by the OEM, especially if there is any expectation of modification. And I don't know of any system that doesn't sometime get modified one way or the other. The configuration control for Class 1 changes should always be in the hands of the military, so the approach that I would take is let the OEM maintain the data package; let the appropriate Service have control over the CCB, with respect to Class 1 changes; with respect to competition, you can still have your competition and you know that your data package is current and accurate.

Mr. Smith

I didn't quite get down to the bottom line, Doug, but thank you because I think that you've started on exactly the right track that I finally arrived on, and I think that the answer is that you need to look at certain elements and analyze them and perhaps the easy answer isn't the best answer. If you assume for a minute that we're talking about a large-scale device -- and I pick weapon systems trainers because I'm more familiar with those and I'm talking about a weapon system trainer that maybe includes visual system, motion, DRLMS, the whole bag of what we know as our most current state-of-the-art devices -- I think that we've got to take a look at what are the possibilities of doing that from day one, and here's the reason that I kind of arrived at that position. If, in fact, you do go with the OEM and you go for some significant portion of time, all of those factors that I previously reiterated -- the removal of anomalies, wait until you get the logistics support package in place, and so on and so forth -- if you wait for all those to happen you find out that two years down the road you've got the same problem that you had on day one. So you need to take a look at what really is

required and which one of those things has to be solved in order for you to go competitive. I think it's possible, also, to take a look at it from the cost standpoint. Having had only about 48 hours to mull this over, I really didn't have time to do a complete cost analysis for you, but I did take a look at some of the factors. Training, for instance. If we're going to turn this device over at some period in time, where's the training going to come from? It doesn't really matter whether you do that and plan to do it from day one, or whether you wait two years and go with the OEM because the answer is the same. The only person that has any capability is the OEM. He's got all the experience, he's got all the data. So you might think about the fact that somebody is going to have to pay for that training that's required to convert that to a COMS type contract and it's like the guy on the commercial who has the oil filter -- says you have to pay me now or you pay me later. The Government is going to pay for it. So then you have to take a look at what time is the best time for the Government to pay for it. And I think it's right up front when the device is being built. That's the time that the customer has got the big hammer because he's in the process of having this device manufactured, and if the customer says to the OEM, I want to bring in the COMS contractor and I want to train the COMS contractor, what's the prime going to say? No? I don't think so. There's also going to be a loss within the prime's interest in the device two years down the road. So I think there are some significant advantages to making that a line item in that acquisition process and buying that training for the COMS contractor right up front. And frankly, I don't think it's any harder than the way we've been doing business for the past several years. We've been training the TDs during the final assembly, test, installation, and acceptance part of the life of the device, and I don't see why we couldn't do that with the COMS contractor, also.

Mr. Netzer

I never expected to hear a view like that from an OEM. It sounds good.

Mr. Smith

You told me to be innovative, Bernie. I may need a job tomorrow.

Mr. Netzer

We're out of time. However, there's nothing else going on so those of you who want to stay can stick around because we have a bunch of questions that we'll answer if you want us to.

This question is to anyone -- how to handle major mods by the OEM or third party.

Panel Member

I think, to start with, when you start looking at a major mod, the first thing that you have to address is that technical data question that has jumped up two or three times. If you assume that the technical data package is intact and it's there, then I think that the question of a major modification can be pursued by any of the contractors.

Panel Member

I don't necessarily agree with that because not everyone has the expertise or the intimate knowledge or the engineering experience to go ahead and do that mod as effectively as the OEM. Even though he has all the documentation, he's going to have to have somebody go in there and become familiar with it, someone is going to have to understand what the problem is. There's a learning curve there that's going to cost money and/or give you a modification that isn't as effective.

Panel Member

If they're going to compete, that's a part of the evaluation and we are going to have to participate in that and have to be able to propose appropriately so that we can be selected and prove that we have that expertise. That's going to happen. I don't care whether it's the OEM or third party or whatever, I will bid as third party to almost anyone's equipment with sufficient documentation. I'm sorry that I can read off to you right now what sufficient documentation is because each of them has different terms, but I do agree that such things as detailed tech orders are not necessary.

Panel Member

I think SECNAV made that clear also, that doing business with Department of Defense, we're going to be competing everything.

Panel Member

I think there's another factor that's involved here and that's the assumption is that the OEM is the smartest guy on the block and I'll submit that's not necessarily true because that may be true the first year and it might be true the second year, then there's some kind of a decay out there and if the OEM is not involved in the continual support of the device, he loses his expertise just like anybody else does. The guy that at that point in time is probably going to have the edge and the most knowledge and be able to most directly address what's required in that particular mod is going to be the contractor that's on

site. I'll give you the point, Doug, that he does have to have the engineering back-up -- that's a given. If he's not capable, he's not capable.

Panel Member

I think it also depends upon whether the device is one that's stabilized and you're no longer manufacturing it, and it's been out there for two or three years and now you want to modify it. That's a different story than one that's continuing in production.

Panel Member

I don't think that necessarily anybody would go out for one that's in production. Basically, those things are handled by the OEM because he still is putting them through his pipeline and that gets very difficult if you've got someone else generating the mod. Our biggest concern, and I'd like to throw one in, is that in expertise, there are other companies other than simulator manufacturers that are bidding on these contracts and are going to win some of them. I guess our biggest concern from the industry is that they will still have the same concern for the availability as we, the developers of simulators, have. That's our only concern and I'm really not concerned about another major simulator development company competing with us and winning. I am concerned when the others do, simply for the reason that I said -- their concern for wanting other people to buy simulators, the effectiveness of the training is a concern of ours.

Panel Member

I would sure hope that a competing contractor couldn't come in and beat . . . who has an open production line. There's something wrong if that happens.

Mr. Netzer

Next question is for Mr. Baker. If COMS is being implemented to replace the TD, why is it being used in areas that are Civil Service supported?

Mr. Baker

I think what we're talking about are aviation trainers and it's the commander's program, and I think that's the only answer I can give you.

Question

Mr. Purser raised a point which I think . . . Most companies don't manufacture a damn thing, but look out for other people's

equipment. There's a thing called incentive profit -- we're doing work for NASA on that basis and we've never built one simulator in the world, but we're going to maintain an awful lot of . . . simulators. I think what keeps us honest is trying to earn a piece of the fee, rather than the zero that NASA give us at the outset.

Mr. Purser

And in general, I would not place that on everyone and if the shoe don't fit, don't try to wear it.

Mr. Netzer

For Dick Manning, on what basis does the Air Force assume that the user will not be able to demonstrate in-house cost effectiveness? Are there specific studies, A-76 or otherwise; if so, how may copies be obtained by another government agency?

Mr. Manning

I think we touched on that a little while ago. I did say that there were some studies that ASD had completed in the EF-111 program. I don't have those. Those could be obtained by getting hold of the ASD YWL office.

Mr. Netzer

Again, this is for you, Dick. Does the Air Force have any time table for possible phase-out of the training equipment specialists?

Mr. Manning

The information that I have received, the career fields should be phased out within five years.

Question

How did you get that information? We have not been told that at all.

Mr. Manning

I just say that's the information that I've received. I can't say that it's coming straight out of TAC Headquarters; I've not seen any documentation on it.

Question

That's not an official Air Staff position?

Mr. Manning

That's true.

Question

It's being briefed in the Air Staff . . .

Mr. Manning

As the Colonel has said, that has been briefed. However, there has been no official documentation in writing that has come across my desk.

Question

Just a bit more, if I could. We do not have any A-76 studies . . . We don't even have a plan to do them yet because we literally have not been directed to cost study . . . We're awaiting direction from Air Staff.

Mr. Baker

It's probably little comfort, Sergeant, but the Navy enlisted rate was in that state of limbo for a good many years before the decision was finally made and that was only in June of last year, June of 1982, that it was official.

Panel Member

You don't have to have an A-76 if it's going to lower the rate.

Question

The Air Force is the only Service with trained flight simulator technicians, that is, the Air Force will be the only Service. The Air Force right now is still looking at it budget-wise, whether or not they should convert to contractor maintenance support . . . What will happen, say, three years down the road if the contractor cannot support the equipment anymore for whatever reason -- you've lost all your trained individuals. Has the Air Force looked at the cost effectiveness of that? How are they going to retrain all their people that they've lost?

Mr. Netzer

That's the very thing that I heard when I was in Dayton a while back last spring. A Colonel up there told me that the Navy has forced the Air Force to take a very hard look at it because

otherwise the Air Force is going to be training people for all the Services. They'll get trained, get out, and go to work for contractor support in the Navy.

Mr. Manning

We were faced with that situation, again with the EF-111 program. That's one of the reasons why we elected to buy a quantity of spares, abbreviated tech data, and provide a quantity of support equipment. This equipment would all be funded by the Air Force; would be stocked, stored, and issued by the contractor. The end of each year it would be inventoried and it would be in a serviceable condition at the end of a contract. This would then be turned over to another contractor, should he win the competitive rebidding or the original contractor elects not to do the job any longer. This was our insurance, if you will, to preclude what you've just mentioned from happening. At least it would assist us. When the system goes CLS, it goes CLS for the life of the system. There's no more blue suit.

Mr. Sucich

I'd like to support that. Yes, when the Army made the decision we were going contractor logistics support, it would cost the Army an arm and a leg plus more if we ever had to get back into the organic system. However, I cannot believe that our private industry would ever let that money that they're getting for the contractor logistics support to ever go down the drain.

Mr. Netzer

Can you imagine how many companies are lining up to bid on these contracts? Okay, then I think that ought to answer it.

Question

Again, if you're talking availability, I can't understand how if the Air Force, per se, the Government-trained people are getting out and doing the job for the civilian contractors, I can't see how availability is going to be any different if you've got the same people doing the same job.

Mr. Netzer

Nobody is arguing that.

Panel Member

I'll argue it. I'll tell you what I have seen. I have seen that when these military technicians are relieved of all these mess cooking jobs, bus driving jobs, watches -- all of a sudden

they can produce a whole lot more when that's their only job. Argument?

Question

Has the Navy come up with a specific specialty for quality assurance evaluators?

Mr. Baker

We have a program we call Quality Assurance and Revalidation Program, where we have technicians go around -- we've had this in being for some time, when we had our organic maintenance force, and we'll continue to use that as a check on the trainers.

Question

How do you intend to train the QA people?

Mr. Behler

I can talk to that a little bit, if you'd like. This question of talent is one that has concerned us a great deal, and despite the fact that the coffers are currently full of a good many resumes, we are already seeing particular areas where we think that there's a lack of talent. So we're trying to address that in several different ways. One, I think, that bears directly on what you're talking about is what do we do ten years down the road, and we are already talking to two -- one is a trade school and one is a university -- and provided them some information on what we think the needs are going to be in the future. They seem to be interested in continuing to pursue that with us. I wouldn't be at all surprised if you don't see that as a major trade school. In fact, I've thought about getting out and starting my own trade school.

Mr. Netzer

To answer your question a little more completely, Colonel, in the Navy program right now they are intending to retain some technical capability -- technical capability that will be trained on the individual equipments that will act as a COTAR or technical advisor to the COTAR. So there will be a source for training available to train the QA people.

Panel Member

To be QA, you don't necessarily have to be trained on a particular simulator. You could have an electronics background, and with a good configuration plan that you monitor and good QC procedures, could come in and be inspected periodically. We recommend that.

Mr. Netzer

Here's a question for a contractor, either AAI or Link. If availability is the major contract criteria and availability begins to fall, would you endorse significant increased contractor audit by the customer to satisfy the training syllabus concerns?

Mr. Smith

I think the first answer to that is we wouldn't need any additional audit because we'd be in there working hard to get back up to our contract commitment, whatever that is. Beyond that, I'm not sure that I understand the question. We have been asked to and have responded in the RFPs with a fixed price type contract, and we know what the requirements are and we don't expect to get any relief from those requirements. We expect to live up to it. So I don't really understand the connotation of audit.

Mr. Netzer

I'd say a little over-the-shoulder thing is probably what they're talking about.

Mr. Smith

There's a good question. Where's that over-the-shoulder stuff going to come from later on?

Mr. Purser

Number one, if we were in that position, we have always made available everybody we have in the facility, whether it be Binghamtom, Houston, California -- whatever we need to bring the simulators up and that's the approach that we want to take. What we're actually asking for is a total support program that gives us the latitude to do that. We don't have many of those programs. Our Army program is that way. We have one in the Air Force, and that's all. All the rest of them are a mix of a bag of one type or another, either intermediate or whether we're the depot or whatever. I don't know as monitoring that is to determine whether or not we're doing a good job, or if it would do a lot of good. We're going to make it available, one way or another. If not, I'm sure there are going to be some contracts people on our backs and we'll have more audit than you'll ever see.

Mr. Netzer

Lou Sucich, how many years can we let a contract for with options, and can we overlap contracts? Contracts include software and hardware. Are we required to go competitive?

Mr. Sucich

I may have to interpret this. First of all, one-year tract with, I guess, up to five years option, but we're dea with, in the case of the Army, . . . monies or O&MN in the of the Navy, which is one year monies. And I don't want tc into this too much further but the real problem here is wit being one-year funds and with us being under a continuing r tion and the fact that . . . monies is defined as you spend you use it, we have great difficulties in this aspect. We considered having this as one of our issues, except that we know how we could change the Congressional way of doing bus and so there's really not much more to say on it. Can we c contracts? I really don't know what that's asking. Does a else think they know what that means?

Panel Member

I think what he means is that ycu have a device contra with, say, Singer delivering a product, and it involves . . vice and after a period of time it may have spares in it or thing like that, certain things that may have to be conside go on in the future, would the other contractor COMS -- wha covering what. The answer to that is the contract terminol will determine.

Mr. Sucich

I can see what some of it is. What we envision doing we're adding things on and we're doing it somewhat now with is we will start with a contract and in the contract we'll ally specify what devices are supported under that contract other words, we will list them along with locations, along usage rates. And that's what we'll basically contract for. other devices of like -- like we're having the AEGIS Air De coming down line -- come in during a time that the contract ongoing for, say, the basic MILES, this will then just be r ted individually as an add-on to the existing contract.

Mr. Netzer

Please comment on industry's feeling towards total cor training versus contractor logistics support to include whc own the training device under the total training concept.

Panel Member

The Government should own the equipment, even includi ial. The material should be the property of the Gove: vernment should buy initial provisioning sufficient t simulator -- a year is as good as any to start wi

and I think the approved parts list and the cell should b
cient to give the retail or at the site level spares to r
a year. It should be the Government. At the end of that
there should be an audit. It should be the contractor's
sibility to retain it at that level. As far as the entir
lator, I think the key is a material management plan, a c
ration management plan that's approved by the Government
they want to maintain the configuration of that simulator
it be hardware or software. Whether or not we can do sof
in our particular case we build simulators, we develop th
lator, we develop the software -- we can provide hardware
ware, any support that might be required. Normally, you
have to do any software other than another software to ma
it to be able to troubleshoot, unless you want to update
Usually there are few updates done in the field unless it
modification.

Mr. Netzer

Ed, has a panel decision been made to continue with
is there still a degree of danger of the program being pa
shut off?

Mr. Baker

No, we're proceeding with the program as we are sche

Mr. Netzer

How will the Government ensure the trainer programs,
the MILES system, are indeed possible to compete? How wi
Government ensure that the OEM will cooperate with the co
firm?

Mr. Sucich

First of all, it comes back to documentation and the
that you buy up front to ensure that somebody can compete
In other words, that you buy adequate drawings or whateve
somebody can use to maintain the equipment, that you basi
buy some sort of a training package so a new contractor c
train his people to replace it. But before we go any fur
on that, everybody probably knows that if you switch cont
tors, you're not really switching your labor force. All
going to happen is Joe Blow at Fort Rucker is now no lon
going to be working for Singer-Link; he's now going to be
ing for company XYZ because he wants a job. Singer-Link
find 200 people jobs just like that if they lose it. Tru
couple of the people will go, but the majority will stay
Nothing is really going to change in competition but the
ment of that contract. That's what I firmly believe.

Comment

I'm afraid history is starting to show you differently. The key people - -

Mr. Purser

We've done it time and time again, and if all of our facilities can make use of the people, we will do what we can to place those people. That's part of our work force. It's part of our talent and we want to retain that talent. Sure, there's going to be a number of those people that stay. There will be people who can't move, don't want to move for a lot of reasons and there's no doubt about that. You'll get some of them.

Mr. Sucich

History has shown us that particularly when you're starting out something new and you go out and hire and recruit, you hire and recruit from the area that you are going to be in. So these people are local and in a lot of cases stay local. Another good example is in the Army, we are doing away with the base operations being civilian and we are going to contractor logistics support of base operations. Nothing is changing. In other words, those people now are no longer government employees; they are now contractor employees, but they haven't moved, they haven't changed jobs or anything else and I disagree with Jerry. I really believe that he'll get some back and like you said, the key people -- maybe his management team at Fort Rucker, but the actual labor force that was hired out of the labor force at most of those places are going to stay on the job.

Mr. Purser

You're talking about two different categories -- two different categories altogether. The people that we put out there are moved out there. They go through a training program and then they're assigned and because we continually move them and the way we operate is such that the people are moved from base to base. I totally agree with you that if we were to have a fixed base assignment and we didn't look at moving the people and have the latitude to move them because we're continually putting simulators into the inventory, you're right. If they were replanted, they probably would stay. But that's not the situation in the training field right now.

Question

The Government really dictates that situation by giving you [illegible] contracts, which do not . . . relocate personnel. [illegible] way you can take 200 people in Nebraska and put them [illegible]. The Government dictates the people stay there.

Panel Member

That's not true. We have a provision. In fact, if we are terminated, the Government has to relocate every single one of my people.

Comment

You're very fortunate. If you look at the majority of contracts now being let, that is not the case. An ABC, for example, needs 120 people on a Basic Ordering Agreement, and there's no relocation.

Panel Member

Well, we have termination and liability and if we are terminated at the end of the year, as I said, the cost of relocating every single person back to Pasadena, California, and keeping them there for 30 days -- we're expanding very rapidly.

Comment

I'm based in Pittsburgh, and the problem there is that the company has to give the Government personnel right of first refusal.

Panel Member

But that's not the case here. You can't do that with a contract like this.

Mr. Netzer

Next question. I understand NTEC is buying the trainer from a contractor but putting the support services up for bid. Why not a complete package?

Mr. Baker

I think that there again, we're committed to compete the COMS as early and as soon as possible. However, we will be on the new procurements buying a complete package, that whatever support we do buy will be part of the initial bid. It won't be as we've done business in the past where we buy a trainer and then buy support at a later date.

Mr. Netzer

This question is for all -- how will changes ECPs be completed with contractor limited data -- sole source to maintaining contractors. I think that one was really covered under

the documentation thing. We've agreed we have to have more documentation, or at least sufficient documentation. Jerry is going to tell us how much, right?

Next question -- how do you propose to handle new or emerging training devices? I think we've covered that pretty well. Does anyone have anything else they want to ask?

Question

This is for the Army . . . up there. How are you now handling those . . . that have been done by the team in the past? I'm talking primarily acquisition and testing of new devices. In the Air Force we use the NCOs to a great extent. Is somebody covering that for you?

Mr. Baker

From the Navy's point of view, we have a Fleet Project Team that's part of the procurement team. We also have various specialists from the procuring activities -- engineers, logistics specialists -- that go in on acceptance and testing of the device. In addition to that, NTEC has a field engineering force where we have people located throughout the United States and they are technical people who will serve in this function.

Question

Isn't it true that you have not used your TDs to the extent that the Air Force has . . .

Mr. Baker

Only to the extent that the TDs were part of the Fleet Project Team, and in those cases they got deeply involved in the acceptance and testing. They're usually the Journeymen Technician type.

Mr. Netzer

Thank you, gentlemen, and thank you for being a very patient audience.

BANQUET SESSION

NOVEMBER 15, 1983

Mr. H. L. Yoh, Jr.

Distinguished guests, ladies and gentlemen. I am Spike Yoh and I have the privilege of being your master of ceremonies this evening. Welcome to the Fifth Interservice/Industry Training Equipment Conference banquet.

The invocation will now be given by Lt. Col. Harold E. Hayes, Assistant Command Chaplain, Air Force Systems Command.

Lt. Col. Harold E. Hayes

What doth the Lord require of thee but to do justly, to love mercy, and to talk humbly with thy God. It is in this sense of your stewardship that we pause to acknowledge the good and perfect gifts that have come our way. Oh God, amid the vast and swift changes of our times, You abide ever the same and we confess our inability without thee to deal with either progress or decay. We pray for Your steadying presence with all who are confused or in any way afflicted as new powers, new methods, and new needs unfold for us. We pray for all who fear change or all who find their secure ways threatened. Give them faith and courage and the spiritual and material resources to find newness of life within in the midst of newness of life without. We pray for all who, in impatience, long for change, who seek escape from present boredom or hardship. Give them faith and courage and the discernment not to embrace, in their bewilderment, a change for the worse. We pray for all who accept change and who endeavor to make of it progress and growth. Give them faith and courage to meet every temptation with integrity, all hostility with love, each difficulty with a reasoned determination to serve God and man. Bless the bread we break together and the cup that we raise in common tonight. For all our gifts from You, Amen.

Mr. Yoh

Thank you, Chaplain Hayes.

Ladies and gentlemen, please at this time allow me to introduce the guests at the head table. Starting on my far left, your right, Colonel Gerald A. Blake, United States Air Force, the Deputy for Simulators, Aeronautical Systems Division. Colonel Blake is the Air Force member of the Interservice Executive Committee, responsible for producing this year's conference. Next,

Mrs. Margaret Ann Todd, wife of Mr. John Todd, who will be introduced in a moment. General Henry A. Miley, Jr., United States Army, Retired, the President of the American Defense Preparedness Association. Moving to my far right, Chaplain Hayes, whom you've already met. Mr. John Todd of the Singer Company, Link Flight Simulation Division. Mr. Todd is Chairman of the Fifth Interservice/Industry Conference, is responsible for the overall management and implementation of this most successful meeting. Mrs. Emily Blake, wife of Colonel Blake. And last but not least, and much more about him later, Senator Strom Thurmond.

Colonel James G. Dixon

Ladies and gentlemen, I've just had a marvelous experience dining with a gentleman who I'm going to introduce to you in a few moments, but first I'd like to preface my introduction with some remarks concerning what he's done. For three days I've been here going to the various presentations, and of course, like everybody else, walking the floor and marveling at all the many things to see down there. The thought occurs to me that with all of the grand, exciting things that we can see on the convention floor, we may lose the perspective of the true intent of this conference of exchanging ideas and information. Tonight, for the first time in the five conferences that have occurred, I have the distinct honor to make a presentation to the recipient of the Best Paper award. Now, the purpose of this award is to provide some professional motivation to those hard workers who do all of that kind of thing that gives us the reason for getting together and exchanging information. Also, I might add, this award is designed to offer stimulation so that next year perhaps some of the papers will be even better than they were this year.

The award, for your information, is based on the contribution that the content makes to the industry. Of course, the quality of the content has a vague factor. And then the presentation itself must be of sufficient quality to be merited. The selection process, I think it's fair to tell you, was handled by a committee of six of our peers. There were four from industry, two from government. Initially, there were more from government, but some individuals had to disqualify themselves because of their association with the papers that were being considered. The whole process began last year with a call for abstracts. The abstracts were submitted and the committee first had to look at some 250 abstracts. This was culled down to an offering for 135 papers, and in August, in Utah, I know of two Marine Lieutenant Colonels, as well as some other folks, who spent a week out in Utah with the very difficult job of honing these 135 papers down to 7 that could be considered this week.

A little bit about the content of the winning paper tonight. It's a content that deals with the comparison of military and

commercial simulators procurement practices. The author makes a special point to convince us that the military can use the commercial methods to reduce life cycle costs in the procurement of our simulators. I read the document today and Jerry, you might say that if Jim Dixon can understand the document it's got to be good. I could understand it and it's very well written, in plain English, and I commend it to you. Just as a note, it's on page 47 of Volume 1.

A little bit about the author, because that's why I'm here and that's who we want to recognize. He's a 17-year veteran of Singer/Link. He has been, as a matter of his background, an engineering manager -- the engineering manager for Singer/Link on the U. S. Air Force's C-130 simulator project. He is currently the Director of Engineering for Commercial Simulation Systems Operation of the Link Flight Simulation Division of Singer. Education-wise, he holds a Bachelor of Science degree in Electrical Engineering; he holds a Master of Science degree in Industrial Management, both from Clarkson College of Technology. I also had the pleasure to dine with his lovely wife, Nancy, tonight. They have three sons, they're hockey enthusiasts. Would you please give a big round of applause to the winner of this year's Best Paper award, Mr. John S. Hussar and please, Nancy, will you join us up here at the podium.

Mr. John S. Hussar

Thank you very much, Colonel Dixon. I consider this a tremendous honor and a great privilege. I'd like to say thanks to the selection committee for selecting me and also thanks to the people of Link who have helped me in the preparation of the paper and also of its review. I'd also like to say a special thanks to the Link management, Mr. Turner and Mr. Quast and the other people who were very supportive in allowing me to do this paper. Thanks, also, to John Todd, to John Hammond, Colonel Blake, and all of the people who have put together what I consider just an outstanding conference. Thank you very much.

Mr. Yoh

Thank you, Colonel Dixon, and congratulations, John. Very well done.

It is now my sincere pleasure to introduce our speaker and honored guest for this fifth Interservice/Industry Training Equipment Conference banquet. He is a distinguished American who is no stranger to most of us. He is the senior senator from the great state of South Carolina, and his 29 years of service in the United States Senate is a continuation of his lifetime of public service. He has been a teacher, an athletic coach, a superintendent of education, a state senator, and a Circuit

Judge. During his tenure as a Judge, he took leave of absence to serve in the U.S. Army in World War II. In fact, he landed in Normandy on D-Day with the 82nd Airborne Division. From 1947 to 1951, he was the Governor of South Carolina. In 1954, he was elected United States Senator as a write-in candidate, the first person ever elected to a major office in the United States by this method. He was re-elected to the Senate in 1956, 1960, 1966, 1972, and again in 1978. In 1959, he was promoted to Major General, U.S. Army Reserve after 36 years of Reserve and Active service. At the present time, he serves as President Pro Tempore of the U.S. Senate, meeting with the President each week to discuss issues of national importance. As President Pro Tem of the Senate, he is the third in line of presidential succession. He is the Chairman of the Senate Judiciary Committee, the ranking majority member of the Armed Services Committee, and the ranking majority member of the Veterans Affairs Committee. Ladies and gentlemen, please welcome the Honorable Strom Thurmond.

Honorable Strom Thurmond

General Miley, Captain Jackson, Colonel and Mrs. Blake, Mr. Yoh, Mr. and Mrs. Todd, Colonel Morehead, Chaplain Hayes, distinguished members of the military, and ladies and gentlemen. First, I want to congratulate the American Defense Preparedness Association for sponsoring this conference. The ADPA has been very prominent and has done our country a great service for a number of years. I'm very proud of this organization and I want to especially commend it for what it is doing in sponsoring this Interservice/Industry Training Equipment Conference.

It is a distinct pleasure to be here this evening to share with you my views on our national defense. The constitution empowers a Congress to provide for the common defense and in my opinion, that is the most important function of the Congress. Those of us in Congress who feel that defense is the nation's first priority are greatly aided by dedicated men and women like yourselves who know that peace is only preserved through defense preparedness.

The concept of your joint training conferences is an excellent idea and I know that the exchange of ideas between industry and the military benefits both in preparing for our national defense. In a day of rising costs and ever increasing Congressional and public scrutiny of Defense spending, it is imperative that we continue to work together to get the most defense for the dollar spent. As technologies have emerged, the means of waging war have become more and more complex. The principles of war, as stated by . . ., seem quite simple when they are compared to the problems involved in deploying and maintaining a large combined armed force in time of war.

This evening I would like to share with you my perceptions of our current Defense posture and an overview of the threat with which we are faced.

During the Vietnam War, the United States spent billions of dollars on the war effort at the expense of many of our research and development programs. During the 1960s, as we became increasingly involved in Southeast Asia, the Soviets sustained large production efforts and research and development programs. This trend continued through the 1970s and is in full swing even today. During the 1970s, the United States experienced public sentiment for reduced military expenditures. This apathy about Defense spending, although historically characteristic of American attitudes following both World Wars and the Korean War, could not have come at a more disadvantageous time. I might add that this sort of thinking dates as far back the the post-Revolutionary War era. During the Constitutional Convention held in Philadelphia in 1787, one of the delegates suggested that the United States Constitution limit our land army to 5,000 men. This proposal was dismissed when another delegate suggested that our Constitution also limit invading armies to 3,000 men, thereby ensuring that our 5,000-man army would be a sufficient deterrent to attack. Unfortunately, what is necessary to deter aggression today is not much clearer than it was 200 years ago. Our national attitude toward Defense spending in the 1970s allowed the Soviets to press their advantage through increased research and development efforts and accelerated production rates. I refer to this period in the history of the United States as a decade of neglect because our apathy yielded to the Soviets both conventional and nuclear superiority.

There were other factors following the Vietnam War that impacted upon our military capability. One factor was the turmoil in the Executive Branch during the 1970s, followed by vacillation of the Carter Administration in the late 1970s. President Carter promised to reduce Defense spending during his first campaign, which appealed to the general public sentiment of the times. After the invasion of Afghanistan, however, President Carter admitted that he had been deceived by the Soviets, revealing a rather unfortunate naivety on his part. The Executive Branch does not bear sole responsibility for our problems during the 1970s. Congress was more than willing to yield to public sentiment and not fully fund Defense programs as needed. The Congress also enacted legislation that caused our foreign policy to lack cohesion and direction, thereby making our allies doubt our intentions and our reliability. An example is the War Powers Act, which inhibits the President from acting as the nation's chief spokesman and architect of foreign policy. I might say that we discussed that this morning at the conference of the leaders with the President. It's something that now is causing concern. It's a bill that never should have been passed.

Recent Congressional actions concerning Lebanon and Grenada reenforce the difficulties caused by the War Powers Act. During the 1970s, Congress took steps to emasculate our intelligence gathering capabilities. While the Soviets increased their support for terrorism and so-called wars of national liberation, we subjected the Central Intelligence Agency to unrealistically tight control and public scrutiny, causing the CIA to lose much of its effectiveness in covert operations. An example is our gross failure to support . . ., the head of the anti-Marxist union for the total liberation of Angola, who was fighting both Cuban and Angolan soldiers.

The consequences of our actions and inactions are indeed serious. The Soviet Union now possesses a strategic nuclear capability that can put our ICBMs at risk, with a large enough, survivable reserve to maintain escalation dominance. In a crisis situation, this is an unacceptable posture because it seriously weakens our deterrent capability. Additionally, the Soviet efforts during the last decade have gained them great influence in Southern Africa. This places the United States in a dangerous position because many of the . . . minerals on which our industry depends come from Southern Africa. Of the 40 minerals that are critical to national security, the United States imports more than 50 percent or 23 of these minerals. In some cases, such as columbium, strontium, and titanium . . ., the United States imports 100 percent of the material needed. In contrast, the Soviet Union is completely self-sufficient in 35 of these same 40 materials. Therefore, Soviet interest in Southern Africa cannot be attributed to import reliance on non-. . . minerals.

Unfortunately, Soviet interests in such areas are rooted deeply . . . . . as the reserves of imperialism. Stalin's words bear significant meaning for us today and I would like to share with you a quote from Russia's man of steel and I hope you'll listen to this quote. "If Europe and America may be called the front, the non-sovereign nations and colonies, with their raw materials, food, and vast stores of human materials, should be regarded as the rear, the reserve of imperialism. In order to win a war, one must not only triumph at the front, but also revolutionize the enemy's rear, his reserves."

This type of strategy is closely in line with the theory proposed by a Soviet named . . . . calling for exploitation of West's dependence on foreign mineral resources. The desired result would be a weakened defense posture. Soviet President Brezhnev candidly advocated this sort of policy to the President of Somalia in 1973, when Brezhnev told him that the Soviet Union intended to gain control of the two great treasure houses on which the West depends -- the energy treasure house of the Persian Gulf and the mineral treasure house of Central and Southern Africa. Do not be mislead into believing that the

Soviet Union wants to or believes it can physically control the Persian Gulf or Southern Africa. Denying the West access to these two vital regions, however, would seriously disrupt our economies and inhibit our potential for military preparedness. Following the invasion of Afghanistan, President Carter made clear to the Soviets that we consider the Persian Gulf vital to our national interests and he further stated that any incursion into the area would be considered an attack against our interests and would be repelled by force, if necessary. The Soviet threat to Southern Africa is less obvious and much less direct. Moscow maintains most of its influence through the use of Cuban proxies. It is estimated that there are more than 50,000 Cubans in African countries acting as advisors. Soviet support for wars of national liberation in the region, using Cuban advisors, contributes to the instability of the region. The turmoil caused by such actions can easily cause supply disruptions of materials critical to our national security. Such an event actually happened in 1977, when our cobalt purchases were interrupted by the conflict in Zaire. As you know, the French deployed their Foreign Legionnaires to stabilize the situation. That brief supply interruption, however, caused our aircraft engine industry to lose money, which in turn was passed on to the taxpayers through increased costs. Long term supply disruption would be disastrous. Although the Soviets do not depend on non-fuel minerals from Southern Africa, they do import materials nonetheless. They probably intend to deplete known sources before developing their own reserves. If this is true, the long term result would find the West dependent on the Soviet Union for materials critical to its national security.

When Soviet gains in Southwest Asia and Southern Africa are combined with the shift in strategic and conventional forces, the threat we face is indeed serious, but not insurmountable. We must continue our strategic forces modernization programs. The Soviets also need to be confronted with the same situation we faced in Vietnam. The United States should support groups who oppose the Soviets or their proxies. It is unlikely that the Soviets will risk war because we give support to Afghan rebels or to pro-West insurgents in Angola. The Soviet Union is beset by much internal strife, low worker productivity, declining White Russian birth rate, and dissatisfaction in the Eastern Bloc countries. The West must exploit these problems through increased use of such tactics as Voice of America and Radio Free Europe. Outrage over Soviet misbehavior has little affect on the Kremlin. The lack of impact of public outrage over the shooting down of Korean Flight 007 is a perfect example.

Our most potent weapon is the one that money cannot buy and intimidation cannot deter. It is resolve. One word -- resolve. The determination and courage to carry on despite the

odds. Too often we hear the question, "what are our chances for success?" The question that needs to be asked is this: "what are the costs if we fail to act?" Napoleon once pointed out that there are two forces in the world: the sword and the spirit and that ultimately, the spirit would conquer the sword. In recent weeks we have witnessed some incredible evidence of the resolve we all need. You're all familiar with the story of the young marine wounded in Beirut who could not speak because of medical tubes down his throat. Writing a note to his Commandant, General Kelly, he stated, "Semper Fi" -- Latin for "Always Faithful." As a nation, let us not breach the faith by such courageous young men. Furthermore, we should be proud of our President and our military for the successful operations in Grenada. The swift, decisive actions there prevented further loss of life and have begun the return of a nation from tyranny to democracy. Those marines, paratroopers, and sailors did more for human rights and the survival of freedom in a few days than the previous Administration did in four years in office. And they did this despite all of this rhetoric. Once again, actions speak louder than words.

In closing, I would like to say that it has been a pleasure to be with you this evening. I hope this forum will continue from year to year. Our military deserves the best equipment and the best training possible, and I know we share this goal together and I shall work to continue to support the military in every way that I can. God bless all of you for coming here this evening.

Thank you.

Mr. Yoh

I know I speak for everyone here, Senator. Thank you very much for a most informative and inspiring message. It has been our distinct honor and privilege to have you share with us your views this evening.

Ladies and gentlemen, that concludes our ceremonies this evening. I bid you a safe evening and a very informative and productive session tomorrow. Good night.

WEDNESDAY, 16 NOVEMBER

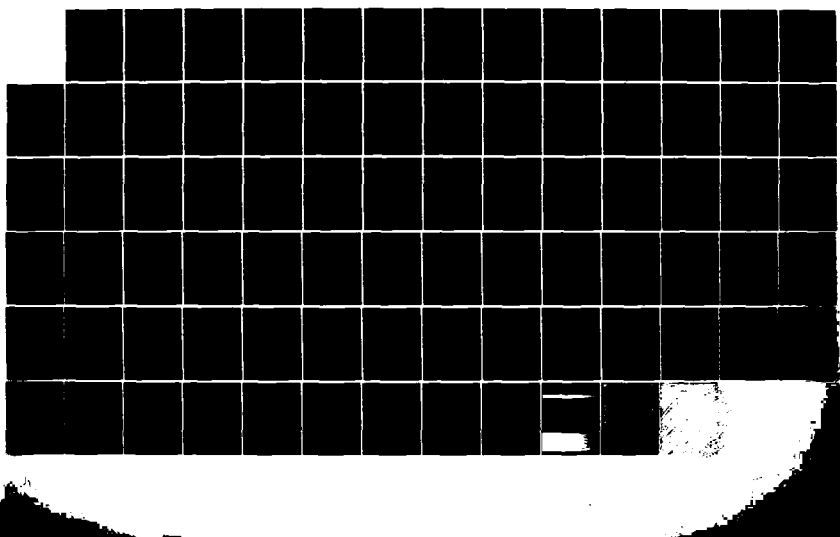
CONGRESSIONAL PANEL

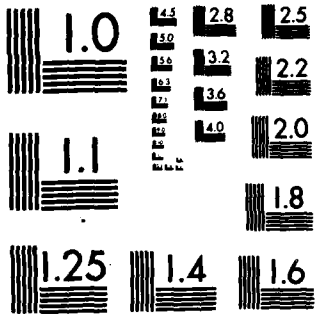
Mr. Robert Q. Old

Good morning and welcome to the Congressional portion of the conference, which we're going to call Congress and Military Training Equipment. We're privileged to have Senator Barry Goldwater as our speaker and panel member, and Congressman William L. Dickinson, ranking minority member, Committee on Armed Services, House of Representatives, and Mr. Tony Battista, Professional Staff Member, Committee on Armed Services, House of Representatives. Our other scheduled panel members, as you may note in your program, due to the exigencies of the Congress, the fact that they have to work while the members are out on panels, had to cancel at the last minute. However, Senator Goldwater said not to worry -- the program will go on. He will stay longer than he originally planned and in addition to speaking and answering questions, he said he will simulate the three missing staff members. When Bill Dickinson heard about that, he said, "I can't let Barry get away with that. I have to come and do some simulating myself." So he only signed on last night at the last minute -- believe it or not -- 9:00 o'clock last night after hearing that we were going to be kind of short, and so I think he gets a special vote of thanks for that.

Let me tell you how we're going to proceed. We're going to have Senator Goldwater make his remarks, then we will begin the panel part of the program and the prepared questions, which will show up on your screen. As time permits, we will take questions from the floor, so write down your questions and pass them to the monitors. You know, normally it's the members that ask the questions, so this is indeed a unique opportunity. We'll break at 10:00 o'clock and then our two Congressional members, Senator Goldwater and Congressman Dickinson, have other commitments, so we will reconvene at 10:30 and Tony Battista and I will continue on.

Let me introduce our distinguished guests. Mr. Anthony R. Battista received his Bachelor of Science degree in mathematics and he has a Master of Arts degree from the University of Oklahoma. In 1963, he was an aerospace engineer with the Manned Spacecraft Center in Houston with NASA, where he formulated and developed a significant part of the command program for the AEGENA/ GEMINI rendezvous program. From 1964 to 1974, he served with Navy Weapons Laboratory at Dahlgren, Virginia. He held the position of Supervisory Mathematician and head of the Guidance and





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Control Division. He was appointed to his present position with the House Armed Services Committee in January, 1974. He is the senior Staff Member responsible for all Department of Defense R&D budget requests. Please welcome Tony Battista.

Congressman William L. Dickinson, born in Opelika, Alabama about a month after me, is serving his ninth term as a Republican Representative from the Second District of Alabama. His district has a direct interest in our conference because it includes the Army Aviation Center at Fort Rucker, an early user of flight simulators and, of course, still a user of flight simulators. Bill served three years in the Navy in World War II and later in the Air Force Reserve. He graduated from the University of Alabama Law School and in subsequent years, served as a city, county, and state judge over a ten-year period. He was first elected to Congress in 1964. He serves on the Committee on Armed Services, is the ranking minority member on the committee, as well as the Research and Development Subcommittee. He also serves on the Military Installations and Military Compensation Subcommittees. His other committee assignment is the Administration Committee, which explains why he has such a good parking place on the Hill. In his distinguished career, he has received many honors and awards for his work in Congress and for his unwavering support for a strong national defense. He is interested in the objectives of this conference and what we are doing, which is evidenced, I believe, by his willingness to be with us on such short notice. Please welcome Bill Dickinson.

Now to our guest speaker. To use a cliche, how do you introduce a man who needs no introduction -- a man that everyone knows and a man of great personal integrity and stature. There are cliches and truisms about the Senator, and I believe some bear mentioning. A legend in his own time; a man who has never wavered from his positions and beliefs, regardless of their popularity; and a man not afraid to tell the king he wears no clothes. Senator Goldwater was first elected to the Senate in 1952 and was re-elected in 1958, and after his run for the Presidency in 1964. He was again elected to the Senate in 1968, re-elected in 1974 and 1980. That's quite a record, to be elected to the Senate five times. As far as I know, he's always served on the Armed Services Committee. I first met Senator Goldwater in 1963, when he was also a Major General in the Air Force Reserve and Commander of the 9999th Capitol Hill Reserve Squadron. I was a Major in Air Force L&L, charged with taking care of the administrative details of the unit. The Senator and I flew many hours together, so I can attest that he is an excellent pilot. And we've flown many times together in simulators. We served together again when I joined the staff of the Senate Committee on Armed Services from 1973 to 1979. In 1974, the Senator was the first in the Congress to recognize the emerging importance of

flight simulators and to hold a hearing on the subject. In subsequent years, he conducted two other hearings and recently he has been trying to find time, maybe, for one more. The Senator has flown in more than 165 different types of aircraft. In fact, we're not sure if anyone's got a record of this anymore but surely it is more than that. And to twist the scene about Will Rogers, who some of you may remember, Will Rogers said he never met a man he didn't like; I think it might be appropos to say that Barry Goldwater never met an airplane he didn't like. We hope the same will be true about the flight simulators, as he serves on Armed Services, he's the Chairman of the Select Committee on Intelligence, he serves on Commerce, Science, and Transportation. Ladies and gentlemen, please welcome my friend, Barry Goldwater, the senior senator from Arizona.

Honorable Barry Goldwater

That's awfully early to hear all that stuff, but I like it. I tell my wife those things every night and in 50 years, I haven't even gotten a grunt out of her.

But it is a pleasure to be here with you this morning because you gentlemen represent, in my mind, a very, very important part of the emerging specialty of America -- technology. And if America is going to go anyplace in this world, it's because of the great number of young people that we have who can understand technology, electronics, microcircuitry, and all of the other things that we have to know to make ourselves better. I think we're so good at it that even the Japanese are having trouble copying, and I don't think the Russians could copy us if we sent somebody over there to draw it out for them. So I'm extremely interested in your profession.

I remember the first Link trainer I ever saw was back about 1940 when I was instructing, and I was responsible, as Operations Officer of my squadron, for 70 hours of Link time for my squadron members who never showed up. I had to go fly the damn thing and I got so good I could write my name. That's the greatest piece of machinery we ever invented, I think, and it really paved the way for what we're doing today.

I mentioned the quality of your industry. I'd just like, in starting, to mention the quality of something else. Recently, I was over in Greece and Turkey -- in fact, I was in Greece the day they blew up Beirut and I was in Turkey the day they invaded Grenada -- visiting with some Army, Air Force friends of mine. This was the remark: "Thank God you finally realized that strength is the only way to get ahead in this world." That was the universal feeling wherever I went and it made me proud to think that we have the strength in this country to make the corrections we have to make. The Intelligence Committee knew two years ago

what was going on in Grenada. We didn't know the magnitude, but we knew what was going on and we knew in our hearts that someday we'd have to do something about it. The President did it and it testified to the great quality of the men that we now have in our Services. We've heard a lot of talk about the uneducated American serviceman -- I can tell you that we've never had as well trained, as intelligent men and women as we have now in our Armed Services and I just hope and pray that the President will realize that as the President of one of the world's great countries, he has a responsibility to project our image as an image that's not going to be stepped on. I'd like to see him go ahead and sort of clean up the Caribbean. I told him that Cuba would make a good 51st state and if we could call it Southern Arizona . . . . . .

But that's not what I'm here to talk about. Congress has just finished work on the Armed Services Bill for this year. A large amount of money -- over $220 billion -- but when we remember that we have gone about 20 years without adequate spending in the Defense field, $220 billion doesn't seem like a lot of money. Even with that, though, it is, and I can tell all of you -- I know I speak for the Senate committee and Brother Dickinson will tell you about his own committee -- we're going to be tougher now on manufacturers. We're going to look at prices a lot more closely than we ever have, and we're going to look at quality a lot more closely than we ever have. We need more equipment and in my opinion, we need, before the equipment, some decision up on top as to a national strategy. This country, to my mind, has never had a strategy that commanders could look at and say, well, now, my tactical efforts are going to be based upon this strategy or this part of that strategy. We are imploring the President and the National Security Council to come up with one, and the Armed Services Committee of the Senate's efforts to make some changes in the Joint Chiefs of Staff or the command structure, something that's not going as well or as fast as we thought it would, we have actually had some volunteers who want to make outlines of what a strategic plan would look like and then we'll get the experts to put in the word.

We have a different situation now than we've ever had and it's one that you should understand because it's going to affect a lot of your companies and it will affect a lot of purchases. It affects not only the House, but the Senate. In the old days, the Services would get together and decide what they thought they needed in the way of equipment. They do their best to not duplicate. And then they'd come over to the Hill and testify before a committee. Now, I'm Chairman of the Tactical Warfare Committee, so I hear testimony on every piece of equipment that can be used in tactical war. In the old days, when Bob was up there, we probably, by the middle of February, would have those hearings all finished and have our authorization paper all ready to go. We'd meet some time in March -- the full committee -- and all the other subcommittees would

make their reports -- and we'd pass out an authorization bill which then went to the Floor for their approval. At the same time, the House was going through all these things. And when we both passed the bills, then we would meet in conference and iron out the differences that always exist between the two committees, although they're never very great and the House always wins their arguments. (What we're looking for is the time when they get tired and we can maybe get a point across.) Then, of course, it has to go to Appropriations after we've gone through all of those maneuvers, and Appropriations, in those old days, would say, yes, that seems like a good sum of money and we'll approve it. But some time a few years ago, somebody invented what they call the Budget Committee. I think you will agree, had you been here at the time, that it sounded well. You operate under budget committees in your own businesses; you don't make money decisions without consulting your budget people. But it got to be a different thing in the Congress. Now we go through the rigors of writing an authorization bill for tactical use. It then has to go to the Budget Committee, who says, well, you spent too much. We want you to spend this much. Then we have to have another group of hearings to then figure out where we can cut. Now, once in a blue moon -- and it's never happened to me -- they'll say, "you haven't spent enough." I'm waiting for that day. Then after that is done, along in about June or July, both Houses going through the same thing, we finally get together a bill and we pass it through the Senate, they pass it through the House, we have a conference on it. Then the devil steps in again. When it comes back to the Floor and it's supposed to go to Appropriations, the Appropriations Committee can make any changes they want. That's something they didn't used to be able to do. They actually can change the number of tanks we buy, the number of aircraft, the number of simulators. So the question that has come up in my mind and the minds of other members of the Senate committee -- I don't know if the House has gone through this yet -- do we really need an Armed Services Committee anymore? Why not turn it all over to the ultimate deciders -- the Appropriations Committee -- most of whom haven't a real idea which end of the airplane goes down the runway first, and if you want that kind of equipment for the Armed Forces, that's the place to go for it. I'm very hopeful that some day soon we can either change the way this system works, get back to the way it used to work. It will require some corrections, it will require some giving here and there, but we have to do it.

I've covered pretty much everything I wanted to. I just want to tell you how very important we think flight simulation is. Not just flight simulation, but simulation for all weapons. I've been down at Fort Rucker, for example -- I'm a helicopter pilot, myself -- and I'm convinced that 15 hours or maybe 20 hours in a helicopter simulator, and I wouldn't be afraid to go out and ride check pilot with anyone who had never taken one off before. They are that good. I've fired the M-1 tank and I just looked at your

new simulators out here and they're precisely the picture. We're developing some of that type of equipment through Lantern for the Air Force and you're developing other equipment that is less expensive,which we like, which will do the whole thing. So simulation is what we really are interested in. I'll have to say that if it hadn't been for Bob Old back in those days we probably wouldn't be as far along as we are. It's not easy to tell the average member of Congress what a simulator is. To begin with, it's hard for them to imagine the electronics and the computerization that is needed to accurately simulate flight to the point that you can take off, fly a course or courses, go through any kind of weather, bring the ship back, and land it. It saves money. We're very proud of our simulator section over at Williams Air Force Base, where we train all of our good fighter pilots. There are a couple of other bases that make a crack at it, but Willy has to do the real job.

So your business is here to stay. I was telling Bob that I was amazed to see this many people. I remember the first convention we had, you could have held it in the men's room. And I think that's where most of them were.

So Bob, I don't have anything else to say. I think one thing that you all can always bear in mind, particularly those of you who are not in uniform -- the members of Congress need educating. Jefferson once said that the only thing wrong with Congress was there were too many lawyers, and boy, he was sure right. I have nothing but respect for lawyers, but I also like to see some other people around who understand weapons and understand a little bit about tactics and strategy and foreign policy and bundle it all together. So when you ladies and gentlemen get your Congressmen home, ask them out to the plant and show them what you're doing. Let them sit in the simulator. Let them spin in. Let them have trouble. Let them see how much trouble the young man has adapting to modern weapons and after he has adapted to it, how easy it is for him to progress.

I want to thank you for inviting me here this morning and Bob, what you said about holding a hearing -- we're going to. Right now you can't hold anything for that Congress. I won't say anything about the House -- they did beat ERA yesterday, and for that I'll kiss Dickinson on top of the head. No disrespect to you women -- I'm all for equal rights just so you get home in time to cook dinner.

Mr. Old

Thank you, sir. There are some things you cannot simulate.

Bill Dickinson will take the podium for a few moments.

Honorable William L. Dickinson

Thank you, Bob. I notice you said "take the podium," which is about all I can do because nobody can follow Barry Goldwater. It is a pleasure to be here with you and share a few thoughts. I can't disagree with anything that Barry said.

I think most people have very little appreciation of the entire process that we go through to procure our defense. One is the administration in OMB; one is DOD; and one is the Congress. Between the three of them, there's enough fault to go around for everybody. Our procurement process is sort of a jumble of things. I've said this in committee, but it's true -- it looks like some times when DOD comes up, it's like the fellow at home who stopped by the local bait shop on his way to go fishing and he wanted to get some nightcrawlers and he asked how much were the worms. The fellow said, "All you want for $1.00." He said, "Well, give me $2.00 worth." I think that's the perception that the public probably has of the DOD procurement. Quite often, when things go awry and the programs get out of kilter and we have overruns and excessive costs, quite often it's a direct result of the administration in OMB's decision on what and how to buy. Sometimes it's DOD's decision, trying to stretch the cloth to fit the pattern. But just as often, if not moreso, it's the Congress. I can't disagree with anything that Barry said about the dichotomy between the appropriations and the authorization process. He just didn't say enough. Theoretically and historically, the Armed Services Committee of the House and Senate have been those who had the expertise who spent all their time on this particular subject matter. They set the policy, they decided the numbers, and they said, okay, now, this is the pattern and they sent it over to the Appropriations Committee to see how much cloth they had to fit the pattern and if it's not enough, they have to cut it down. They don't get into the management of it or the philosophy of do we need this weapon system or not, which weapon system between the two. It's true that the budget system gets into it, too, but you see, we have a strange thing this year. The Administration sent over a budget asking for about 10.2 percent real growth. We go to the Budget Committee and the Budget Committee in the House and Senate, after they got through cutting it, cut it down to a little over 5 percent real growth. With this amount of cloth, then Barry's committee and my committee go to work on it and say, this is what we've got to work with, now how much can we fit into this and what can we procure? What can we spend? And we did it and we did it surgically and we did it effectively. Some things fell out that I didn't agree with, some things fell out that Barry didn't agree with, but this was the product that we came up with and we think we did a pretty good job because we did what the House said -- this is how much we're willing to spend -- so these are our marching orders and this is what we said we would spend it on.

Then it goes to the Appropriations Committee. We cut $12 billion out of the Administration's request. When it came over from the Administration, DOD, OMB, to us, we cut it about $12 billion to get it to 5 percent real growth. Then the Appropriations Committee, though they haven't finished -- they're in conference today -- they cut our real growth of about 5 percent to between 2 and 3 percent. They cut $9 billion more than we cut after it had already been authorized. Not only that, you see all this swapping and trading going on -- they'll approve this if they'll slip this battleship and put it in Brooklyn and put the next one in Philadelphia and buy this A-10 system because it's made in New York -- all these things get to trading around in the Appropriations Committee, and that's what the final product looks like and it's getting this way more and more. Even though the law says you can't appropriate and spend what has not been authorized, we see a tendency more and more that way and especially in the Senate! Barry will tell you this is true. We've got some sort of working agreement in the House side and it's in loose bounds -- they give lip service to it. They don't even give lip service to it in the Senate. So what the final product will be, I don't know, but we're not spending what has been authorized by either the Authorization Committee or the Budget Committee. We've cut that real growth in half. So ultimately, I think, we're going to have to have a redefining of roles and missions within the Congress, not only the military.

It's a pleasure to be here with you to discuss whatever is on your mind, whether we simulate it or not. Thank you.

Mr. Old

We're going to begin the questioning now. I think we've pretty well covered the authorization and appropriations processes and the budget, so let's take advantage of our panel and maybe for a moment discuss this particular question. The Senator, of course, is Chairman of the Select Committee on Intelligence. It puts him in a rather unique position to evaluate the Soviet Union's military forces. Congressman Dickinson also has access to many classified briefings, of which he can maybe mention a little bit. Tony Battista is an expert on Soviet military equipment and he really understands the capability, so we do have a unique panel. So I would like to ask what is the assessment of the group on the Soviet equipment and their fighting capability, for example, in Europe and using conventional weapons only?

Senator Goldwater

I would answer that by saying that the Soviet's military equipment is good. It's not universally better than ours. They have some pieces of equipment better, but I think, on the whole, we are

equal to them or better. You take their MIG aircraft -- I don't think they have anything in the inventory that can touch our F-15s, F-14s, or the F-16. Our new Abrams battle tank I've seen in the field over in Europe and our commanders over there are finding it -- I can't believe this is true -- over 90 percent ready. That's a high figure, but that's what they say.

The interesting thing is when you get down to the men because you win wars with people, not with equipment. Some guy has to go stick that flag in the ground and say, this belongs to me, before you win it. And we are finding more and more that the average member of the Soviet fighting forces is a rather inferior type of individual. Now, this -- going the other direction from the enlisted man up -- we are seeing a rather rapid change that worries some of our men in Geneva on the conference. The old generals are dying off or they're retiring. Now, these men were never what you'd call well educated. They were just powerful people and pretty darn good commanders in the field. Their replacements coming along are very well educated, very bright, young people. And this is giving our men in Geneva a little concern because they don't expect much in the way of a compromise until the year 2000, when they'll all be gone, but these youngsters, as they come up through the ranks and assume command, will be like a lot of youngsters have been throughout history; when they find themselves in command with large forces behind them -- "why don't we have a war!" They're afraid at that time, the Soviets might be ready or willing to take on countries outside of their own. Now, as you know, they restrict their activities to the defense of the homeland!

So I'd say on the whole that I'd rather be fighting with Americans behind me -- I'd rather have one American behind me than ten Russians. That's about the way it goes in my mind.

Congressman Dickinson

Historically, we've always thought we could overcome the imbalance of numbers because we had the technology that gave us the edge, and while we're outnumbered anywhere from three to ten to one in conventional military equipment or people, we always thought we could offset that by our superior technology. This was even true in our strategic systems -- in ICBMs, that's the reason we went to a smaller warhead because we had more precision than the bigger bang that the Soviets had to go to because they didn't have as good a CEP. However, we have seen, over the past few years, a dramatic improvement in their technology and so they are not only building in larger numbers, but their technology is improving, both in strategic and conventional. I don't say that they have caught us or surpassed us in technology, where they have in numbers, but certainly between what they've been able to steal and what we've been able to sell them, their technology transfer has had a dramatic difference in their ability to upgrade their capabilities.

So the old adage or cliche that we have the technology and they've got the numbers is eroding with every year. It's a matter of real grave concern.

Mr. Anthony R. Battista

I share that same assessment. I'll give you some specifics. First of all, let me say that there's a general misconception that the Soviets are technological idiots. Consider, for example, in directed energy there are three Nobel prize winners for lasers. I think they're ahead of us in directed energy technology. When you look at their tactical fighting capability, I agree with the Senator's assessment that they don't have anything today that will touch the current generation of 14s, 15s, 16s, but they've got four new birds now coming out of Ramenskoye which are getting, I'd say, dangerously close. From what I've seen of their look-down-shoot-down capability, they're coming along. Good pencil beam, radar-type capability that is going to give them good look-down-shoot-down.

When I look across the spectrum of fighting equipment, I think the proof that they are good in some areas is borne out by the fact that today they've got the world's fastest submarine -- the Alpha -- 45 plus knots. They've got the world's biggest Cruise missile-carrying submarine, the . . . The Typhoon is bigger than our Trident, and you know where they've come in accuracy. There's a general misconception -- I call it a myth -- that we're better than the Soviets in strategic accuracy. Wrong. They're about 20 percent better in terms of deployed hardware today with the SS-18 Mod 4 warhead. Now, when we get MX, we'll reverse that trend, but we've got a lot of good technology but the fact is, it's got to be deployed.

Across the spectrum, they're matching quality now with quantity, which worries me. I think in the future, we're going to have to be concerned because as I see it, we've got ten yards of requirements and about three yards of Defense budget. I think that was the first question put up there -- do we have enough or are we spending enough on Defense? The answer is no. We could be spending a lot more to maintain at least the gap, but we've got to start deploying some of this emerging technology, too -- sensor fuse, terminally guided submunitions, things of that nature, to go along with the good complement of weapons we have. What worries me is our shortfall in the inventory. Last October, a year ago, I was over in the Med. I remember asking an Admiral, what do we do if the Soviets decide to oppose the landing of the 32nd . . . if they mount an offensive out of the Crimea with Naval Air, and the answer was, "I get the hell out of here because I have one aircraft loadout of Sidewinders, I don't have the sustainability, and I really have a problem."

So I think we have an awesome threat out there that this Administration has recognized -- first time in a long time -- and I think if we can convince the American people that we have far more requirements than we have budget, we'll be back on the right road.

Mr. Old

I want to follow up on this because I want to take advantage of Senator Goldwater and the Intelligence Committee. Certain restrictions imposed on the Intelligence Committee by the Carter Administration have recently been relaxed and/or removed -- at least that's my understanding -- and the question is, is our Intelligence community now unencumbered enough for the work it must do?

Senator Goldwater

Well, it's a longer story than what you have. Back in the 1970s, we had a committee in the Senate called the Church Committee that was set up to investigate the so-called wrongdoings of the CIA. Now, the wrongdoings, it turned out, were all done because of orders given by the Presidents, both Republican and Democrat alike. The CIA is very limited as to what it can do. The CIA cannot go out and wantonly execute somebody, but if the President tells them to do it, they'd salute and do it. Well, that's what happened and the Church Committee raised so much hell, uncalled for, that we lost a lot of our top assessors. Those are the people with 5 to 15 years' experience who can put together what he picks up and I pick up and come up with a probable answer. Then we had the days of President Carter. I think he did just exactly what he thought was best. He appointed an Admiral as head of CIA and, with all due respect, he tried to run that agency like he'd run an aircraft carrier and it won't work. When the present Administration came along, they appointed Mr. Casey. I'm not going to talk about him, but I call him Flappy because he's so hard to understand. But he's done a lot of good. We have now more people wanting to join the CIA than we ever have had in history. Our assessor group is picking up, not only in numbers but in quality, and I think I can safely say without going into any detail -- a lot of this detail some of you know -- we have the best electronic surveillance in the world. When we lost Admiral Inman, we lost, in my mind, our (at that time) greatest intelligence asset and he's gone to work for private industry and that will help private industry. Our system yet is not as good as the English or the Israeli or the Soviet, but it's getting there. Our weakest point in our intelligence is the human, the eyeball. We don't have enough people in the Soviet Union, for example, to go in and rub their hand over a warhead or take an assessment of a new airplane and send it back as something that he had seen with his eyes. But it's

getting better and you have an intelligence system in this country that you can be proud of, in spite of the Washington Post and the New York Times or Baltimore Sun and so forth that just hates the word "intelligence." It kind of reflects in their writing, too.

Congressman Dickinson

Let me just add to what the Senator said by pointing out that a year ago or a little more, my committee was in Panama. We also went around South America. In talking with our intelligence people in Panama -- and this was before the Falklands and this was before, of course, Grenada -- we decimated our human intelligence resources around the world and certainly in Central and South America to the point where we didn't have two sources of human intelligence per country in South and Central America -- total. So if we didn't know all that there was to know in Grenada, and if we didn't have a good assessment of what the likelihood was going to be in Argentina -- satellites are great and signal intercepts are great if people are communicating that way, but with a relatively unsophisticated country, that's not worth a damn because you have to get there and get on the ground. That's not what they're doing; you can't see what they're doing; you can't intercept what they're doing, for the most part. So we are rebuilding now, but we were really laid low during the Carter Administration. It was a disaster in most every way I can think of -- and I'm talking about intelligence right now.

Mr. Battista

I also do the staff work on the Committee for the intelligence-related activities, as well, and I can't disagree with anything I've heard so far. We're non-partisan staff on the House side, but I will say that during the Carter years, there were a lot of issues that were considered more moral than practical and we lost a lot. I can remember the delegation visit with President Sadat in 1977, when he said, "We're concerned about the ability of your country to look after your own best interests, let alone those of your allies. We're really worried about you." . . . , on January 12, 1980, told us that, in his view, Jimmy Carter was a very simple-minded man, and he said, "And I don't mean that in a complimentary sense." I think he was a very well-intentioned guy, but there are a lot of well-intentioned people who you wouldn't want to see running the country. Senator Thurmond said last night that we had accomplished more in two days in Grenada than we did during the entire past Administration, as far as human rights go. I think it goes a little deeper than that. We finally conveyed to people the fact that we do have resolve and we are willing to act in our best interest. With regard to the press accounts of the intelligence activities, I'd say I hope that if we have to engage in another conflict, we'll leave them at home again. They talk about integrity. I've got some friends

down at LeJeune who report that they're hanging around like ticks on dogs with some of the families who have lost husbands or sons over there trying to interview them on the spot. That, to me, is reaching a low ebb. In fact, I blame most of the problems we've got today in the area of defense on the press. They've always been hostile. I was at the conference in . . . in Sicily on nuclear war this past August, and dear old Mary McGrory was there. You talk about being misinformed -- her birthday was August 23rd and one of the Russian wives played some Russian folk music for her, and she got up at the end and said, "I don't have a very good voice," and after she sang her little song I agreed, but she got up and sang a song that went something like "I'm going to lay down my sword and shield down by the riverside; I'm going to talk of war no more, no more." I gave the American paper with Edward Teller and I was sitting at the table damn near furious and he looked at me and said, "Control yourself." So I sketched out on a napkin the next verse that she should give: "The Russians nuked old Mary's butt, down by the riverside. She laid down her sword too soon."

Senator Goldwater

. . . . . respect for the Naval Air Force. I just think it got a little bit -- it was growing too fast in too many directions. I think what we've done, relative to the A-6 line, will stand and if they get the F-18 performing the way that we all know it can perform, if they stick with the F-14, because I think it's still one of the finest aircraft we have in our inventory, the Navy should have no problems at all. But the Navy does have the basic problem of the aviator and the sailor, and when they get the two of them together, and get the politics out of it, I think it will work fine.

Mr. Old

Mr. Dickinson, I would like to have the views of the House Armed Services Committee on this issue. I think you're fairly close on the low production rates of aircraft, low figures.

Congressman Dickinson

Well, Bob, I don't know that the Subcommittee on the Navy is necessarily in sync with the rest of our committee, but we have a very aggressive and very dedicated Secretary of the Navy. As I understand it, the difference between the Secretary and Paul Thayer is that the Secretary very aggressively pursues a program for the Navy, and the Secretary of Defense feels like he has to look after all three Services and that one shouldn't spend more than his part, and the Secretary of Defense tells each of the Services what their part is. The question then is will that Secretary accept that as his marching orders, or is he going to

go directly to the Congress and try to change the policies laid down by his boss. So I think that's what the fight is about, whether we're talking about the numbers of ships or the numbers of production lines, or what types of aircraft we will pursue the purchase of, whether to get an updated model of the A-6 or stop that production line and go to something newer. I think ultimately, the responsibility lies with the Secretary of Defense and I think ultimately the decision is going to be made -- unless our present Secretary of the Navy can be as successful as Admiral Rickover and go directly to the Congress and beat down DOD and get his program through.

Mr. Old

Tony, from a Staff point of view, does the Navy justify well enough these multiple production lines in small numbers of aircraft?

Mr. Battista

Quite candidly, Bob, you can't put all of the blame onto the Navy for the problems they're having today. Really, this problem goes back a number of years, all the way back to a guy named McNamara, who did a lot of systems analysis type work to justify high/low mixtures and all those buzz words that we've been plagued with over the last couple of years.

Congressman Dickinson

We could spend a couple of days on him, too, if you want to!

Mr. Battista

You have to remember, Bob, the Navy never wanted the F-18 to begin with. It was called the YF-17 back then. The reason they didn't want it is because they have limited deck space on a carrier and in that limited cubic foot area, they have to get as much capability as they can, unlike the Air Force, who can have a mix of varying capabilities. I never liked high/low mix because it always assumed you can negotiate with the other guy to pit his highs against your highs and his lows against your lows. But this was forced upon the Navy -- the whole concept of a light-weight fighter -- and then we turn around and blame the Navy for having multiple production lines and all I'm saying is a lot of it was not brought about by the Navy itself. I remember meeting with Jim Holloway, the CNO back in 1975, when he said, "Look, I want more F-14s. It's a good airplane. I need another engine for it and I've got to change the wiring bundles to solve a lot of my maintainability problems, but it's the best aircraft the Fleet has ever had with the . . . fire control system." And there was a guy named Len Sullivan back then who was at PA&E who shut that thing

down and literally made the Navy go in an entirely new direction. Here they are today with lots of problems -- 13 production lines and more coming. . the VTX. There's a case where we're spending $5.6 billion on a $2.8 billion program because we're stretching it out. For 308 birds, we going to spend the next eight years buying them. So it's a chronic problem; something has to be done about it, but it's not all the Navy's fault.

Mr. Old

I've told our guests, Senator Goldwater and Congressman Dickinson, that we'd have them out by 10:00 o'clock, but I think it's appropriate that we do have one question about flight simulators. So if we can come up with question number 10 -- the Services seem to be making increased use of flight simulators, but do you believe they have the best mix at the present, that is, aircraft to flight simulators, and do you detect any reluctance to use flight simulators by the Services?

Senator Goldwater

I think any answer to that question might be considered premature because we're in the more or less infancy of all simulation. It's 1000 percent better than it was two years ago, but there are still areas to go. I think the Services are making much more use of the simulator. I speak from the experience that I have out near where I live when a pilot can climb in a simulator at Luke Air Force Base, another one at Williams, and one can be a MIG and one can be anything we have and they have dogfights and they train. I've watched the simulation computer work up at Red Flag at Nellis and I think I can safely say that had we had the Red Flag concept before or during World War II or Korea or Vietnam, our losses would probably have been cut by as much as 90 percent. So the Services are very much oriented toward simulators. I don't think, frankly, that either committee of the House or the Senate has held enough hearings on it so that even the members of the committee could become better acquainted.

Do I detect any reluctance? It's always been that a pilot would rather fly an airplane than a blue box, but at the same time, with the airlines doing all of their line checks with simulators and with MAC using the same procedure and with our 89th Squadron out at Andrews that's never had an accident in 30 years of flying, simulators are proving to be an instrument that you cannot live without. The thing that makes me happy about the whole field is not the great advances in flight simulation, but the advances that we're making in the use of all weapons. I mentioned the helicopter, the guns -- I fired a Sergeant York a while back and that's a simple weapon, but it's not simple to learn how to punch the button when you've been using the button the other direction for trimming up an airplane. But they're not going to

put pilots in a tank -- not if the pilot has anything to say about it. So I would say you've got a good market. Just keep at it, educate a lot of congressmen about it.

Congressman Dickinson

Let me say that the Services ran into some problem some time in recent history in their retention because there got to be a tendency, as I understand it, to over-emphasize and over-use simulators. They're great -- you can fly them at night, you can have 24-hour shifts if you want to, if you have the people to man them. On weekends, you don't have to have gas, it doesn't make any difference what the weather is, you go in there and fly your simulators. But then the Services began to realize when you use them too much that their retention rate started falling off because people didn't join the Service to fly a simulator. As the Senator said, they signed up to fly an airplane. So recognizing this and putting it in perspective, they are the way of the future and they are the way to get the most for the dollar involved and we're going to be using them more and more, certainly not less and less.

Mr. Battista

I'd just like to add that I think it's probably the greatest tool we've ever come up with, but in the long run, bottom line, don't substitute for actual flight hours in terms of increasing your combat proficiency. Last year in Beirut, for example, we interviewed some of the TAC pilots and found that one guy, for example, had never fired a Sidewinder since 1972. That was the old AM-9B, if I remember correctly. As Mr. Dickinson said, these folks didn't sign up to fly simulators. They save us money, they're a great tool, a very valuable adjunct, but in the long run you have to understand what the role of the simulator is and what's actually required to keep combat proficiency high.

Mr. Old

We're going to take our break now and come back at 10:30. Our two members of Congress will be departing, so on behalf of the conference and myself, it really was a big effort for you to come up, so let's have a big round of applause.

Question -- (was not recorded)

Mr. Battista

. . . . I have a feeling that the Marine Corps needed this aircraft and all four committees of the Congress repeatedly put

back the funds for it. But now as an after-thought, they came in and said, "hey -- we need a simulator," and the TAV-8A can't really hack it or the trainer can't really hack it; therefore, we need some bucks now. We're supporting the Marine Corps on it, but I think it really should have been done concurrently with the development of the aircraft itself.

Mr. Old

Are you aware of who in each of the Services is the senior working level official for flight simulators and other training requirements? Does anyone come to mind? Should someone come to mind?

Mr. Battista

If they're there, they're taking advantage of a new technology called Stealth. They never make a pitch to come over to see me, with the exception of one guy who is not principally a training simulation type and that's Bill Fitch in the Marine Corps. He's the one guy who came over and made a special plea for the AV-8B trainer. But other than Bill, no. I can't find anybody in the Services who is willing to come forward and make a plea for this particular aspect of the program.

Mr. Old

And you think the reason is because it's just not high enough up on priorities? As you said, tech data packages seem to fall first and money falls out of training and - - - - -

Mr. Battista

Yes, that's right. And there's always the attitude, "Let's put it off until next year or the year after." I'll tell you my own impression. We are fielding too many systems today without the proper emphasis on training, tactics, doctrine. You take the entire Cruise missile program. I get the feeling that people are going to figure out what to do with them, practically, after we've got the full complement at . . . . Similarly in the Fleet. One year the TLAM is fashionable; the next year we're emphasizing the conventional. I wonder when we're going to start paying attention to training, tactics, doctrine as a preliminary rather than as an after-thought.

Mr. Old

This next question follows right along. Are the Services' R&D programs for training equipment well defined? Is there a good relation between the 6.2, 6.3, and 6.4 programs and if so, which of the Services come to mind? If not, how could the Services do a better job?

Mr. Battista

The first thing you do is to give the proper emphasis to deploying hardware as opposed to having your eyes glazed over with the promise of technology, which is what they often do. That relates to the 6.1, 6.2, 6.3 type effort. RPVs -- good case in point. The first experimental RPV flew in 1914 and you look at what the Army fielded in the last couple of years -- nothing in the way of RPVs. Now, 69 years is a long time for advanced development, in my mind. And at the same time they come in with large requests for exploratory development, basic research, and RPV technology. My question is when are you going to field something as opposed to talking about it or telling me how good you are. It's the same in the training simulation programs. We're not deploying the kinds of systems that we have to to meet our requirements, the operational requirements. Yet they keep coming in with bigger and bigger budgets for the 6.1, 6.2 area. And if I had to make a choice, I would just as soon take that money out of 6.1, 6.2 and say let's put it into something that's going to give us combat capability today or increased combat capability in the event the balloon goes up. I hate to sound negative, but my answer is no, there's not enough coordination among the guys who run 6.1, 6.2 tech base, and the beyond 6.3A programs in terms of engineering development. That's where, again, I think the industry can do a better job in getting the DOD to get its act together in terms of saying, look -- what's your game plan? Where's the road map? That's what we ask for each and every year. And you're going to be subjected to more and more funding constraints, too. This year, the Administration wanted 10.2 percent growth. I believe that that was necessary. It's going to come out, as Bill Dickinson said, somewhere between 2 and 4 percent. Next year, the 85 budget was predicated upon that 10 percent real growth. It's not going to be there. Is the Department going to shrink the number of programs they have, do fewer things better as opposed to doing a lot of things rather poorly? I would say no, because the constituency is there for all of these new starts. So we'll probably wind up stretching out a lot of things. Now look at next year, as an election year, and look at the graphs of where we are in the various programs. Medicare, Medicaid -- about a horizontal slope. Non-defense discretionary, HUD -- rather horizontal slope. You look at Defense -- slight increase. Now, very honestly, Defense spending -- the B-1, the MX -- is not going to get Ronald Reagan re-elected. It's going to be the state of the economy, followed by a number of other issues like unemployment, the perception of the United States abroad, our foreign policy objectives, how well we've protected our best interests and how we're perceived overseas. These are the things that I think are going to be important. These are the things that undid Jimmy Carter. When you stop and think of what's going to happen in terms of a Defense request next year, I would venture a guess that you're going to see 5 percent real growth come out of

the Pentagon, and you may even see zero growth come out of the Congress because there are a lot of skittish folks right now who are up for re-election. So things are going to get tougher and when things get tough, remember where you stand on the priority pole.

By the way, I feel a little guilty. We don't have Smith and Rhodes here to rebut anything I'm saying, so why don't you guys stand up and tell me if you don't agree.

Mr. Old

Give your name and your company and how much you're getting out of the 85 Defense bill!!

Tony, do you think the Services' request for flight simulators and training devices are based on real substantive need? Are you personally convinced that these devices are really needed?

Mr. Battista

Yes, I'm very convinced of their need. As I said earlier, when I was accompanied by management -- I'm labor -- these are valuable adjuncts to everything we've got out there today in the way of deployed weaponry. It's very high up on my priority list. And you have no difficulty getting my support for this whole area of technology.

Mr. Old

I wanted to follow up on the previous question about R&D. Each of the Services has a program element generally devoted to training and education, training and simulation, possibly a 6.2 program, possibly a 6.3, and in some cases, 6.4. I think the B-1 program, for example, is under 6.4 program element. Have any of the Services specifically come over and briefed any of those program elements and said, "Tony, these are very important."

Mr. Battista

No. In fact, they're not even strongly reclamaed.

Mr. Old

And yet they get cut, don't they? You cut one this year, by mistake. He did -- he gave it back in conference.

Mr. Battista

No, it's not that. It's just that 1 feel that we on the Staff work awfully hard and these former Staff guys who go out

in industry ought to do something to earn their pay. We wanted to keep Old busy.

Mr. Old

I took him for granted! Well, I think it's an important point. Everyone has to be educated on these various programs and if your companies are dependent upon the funds in some of these R&D program elements, you just have to make sure that you have exposed the committees, the members and particularly the Professional Staff Members, of what it is that's going on in the program. I think this probably would help the Service people because they're not really free enough, at liberty enough, to charge to the Hill any time that they want. All you Program Managers know that, because you've got things called Legislative Liaison that will say, wait just a minute -- we will be the representatives. So you're frustrated. And so there can be, I think, a working relationship between the Services, Program Managers, the contractor, and everyone understands that they're for and the contractor can carry the message to the Congress. Do you agree, Tony?

Mr. Battista

Yes, and if I can deviate just a little bit. During the break I was asked by someone why we had cut the surface warfare trainers for the Navy several years ago, and it was pointed out to me how that reduction back then has really increased the price of the program because the requirement didn't go away. Now, understand where, for example, I'm coming from. I'm one of two people on that staff who handle research and development. There are about 3,500 plus projects in the R&D account and it's everything from undersea to space. I've got the shuttle program; I've got the MX, the B-1, all of the air programs; radiated foods, in the case of the Army; the moon labs that you're reading so much about. All of these things take time. Then my boss, one of 45 that you met here this morning, will call up and say, "I'm appearing somewhere at noon today and I need some remarks. Can you jot something down for me?" In addition to that, I've got all the intelligence work for the subcommittee. I've got a limited amount of time I can put in on any one particular project. Several years ago, I asked a very straightforward question -- at least I thought it was -- with regard to the surface warfare trainers. I said when I worked in the Navy R&D lab, we put together a lot of simulations that we were using to maintain the operational programs. We were simulating and stimulating the environment. I said, now how many of those tools that we've already paid for can we GFE to a contractor and tell him instead of starting from ground zero, see if any of these models that we've got are applicable to this surface warfare training system. The answer comes back to me with regard to the justification for the simulator, how many people they've got working on it, which labs are involved, which industries are involved -- and I really didn't ask you that question.

So I tried again. After the third time, I said, to hell with it. I can't spend any more time on that. I'm up to here in MX. So we've only got one tool, one mechanism that we can employ and that's to cut the budget if you don't get the right answer. Now, that's my criteria -- after the third try, I give up. I can't take any more time. I have other things to do. But that's the reason why that program was cut back then. Wouldn't it have been easier for somebody to sit down and say, these are the tools that you're familiar with; this is why they relate or don't relate to this area; accordingly, we need this much money. Nobody would do that. The Army this year, back in January, had a project called Terminally Guided Projectiles. It read like an advertisement in Aviation Week. All these wonderful technologies -- millimeter wave, active, passive, semi-active laser -- the whole shopping list. I said, hey, you just cancelled Copperhead, the only terminally guided projectile you've got today. How can you justify doing all this technology which is more expensive than semi-active laser when you can't afford to deploy this one? These are going to be more expensive. Never heard from them again, until . . . "why did you cut out program?" Because you never answered the question, that's why. So if you can instill upon the guys who represent you in the Pentagon to answer the questions that we ask, it might save a lot of dollars.

Mr. Old

The next question is about the dollar limit beyond which you'd recommend a program be terminated. These things are getting expensive. You read about them costing maybe more than the aircraft itself. How do we decide how much we pay for one of these devices?

Mr. Battista

First of all, I wonder if they have to be as expensive as they are. I would love to talk to you folks individually about what you get in terms of money for a particular system, and then look at what the Services are asking the Congress for in terms of authorization and appropriation. I once did a little study on my own to see what a Sidewinder missile cost, what the contractor was getting and what we were being charged. It was a factor 3 greater than what the contractor was selling to the Government for out the door. But we seem to have to fund a lot of people and project offices and things like that, and then finally, we're not, in my opinion, taking advantage of the new technology that's available to make things cheaper. I can remember five or six years ago talking to some of the semi-conductor folks at one industrial plant and being briefed on how the price per byte has come down. When I got out of college, for example, the first machine I ever worked on was a 704 and it was somewhere between $1.00 and $2.00 a byte as a general guideline you could apply to

buying a computer back then. Today they talk about 10 of the 6 bytes for a couple of cents. With the advent of very high speed integrated circuits now and other technology, I think we can make things cheaper. I don't understand why the price of electronics keeps coming down and the price of the systems keeps going up. There's something inherently wrong in the process. But I look, for example, at the requirement for a simulator in terms of the buy of the particular system that we're talking about, the projected use of that simulator, what it's going to save us -- I'm not really concerned about the front end cost. I'm concerned about life cycle cost. The answer to that question is obviously something could become far too expensive, but it's not just the up front cost. I look at the five or ten year costs on it and I would say, in general, the cost of a trainer or simulator or stimulator does not, in my opinion, get too high for the capability that it provides. My tendency is to lean towards saying we need it. And I think in answer to the last question, which I didn't answer -- yes, I think the Services do present their programs, even in spite of the little effort, based on substantive needs.

Mr. Old

We worked on this next question last yeat and it's about whether a device should be built with R&D funds and somewhere in the Congress, this somehow got directed. It is my opinion that it was a misinterpretation by the DOD Comptroller, and I think the initial direction came out of the House Appropriations Committee, maybe in 1974 or 1975 or something like that. I hear people who complain about this. I hear people in the Service complain about it, but I haven't heard anyone who is willing to go over and sit down and discuss the issue with the appropriate staff members of the committee. I believe it could be turned around quite easily if the Department was really interested. Does it make any difference to you whether they build these things with R&D funds, the first one? Or procurement? Do we need a prototype?

Mr. Battista

It depends on the complexity of the effort, the state-of-the-art, what you're doing. I don't like to apply universals in the development and acquisition cycle, which so many people do. So I look at it on a case-by-case basis. Some simulators should be built with R&D funds. Others, I think, that are of significantly less complexity, we could do out of the APN account. I hate to see Congress coming out with these mandates -- you will do something strictly with R&D funds. Often, we're more a part of the problem than we are the solution over there. A lot of it is based on a misconception or misinterpretation or, frankly, a lacking in data, which the Services are not really forthcoming

with. So there are no universals that I would apply to this. It really depends.

Mr. Old

Well, you've heard it from one of those who would have a lot to say about whether this mandate continues, DOD, so if you're listening - - -

The Navy recently directed that all flight simulators for new aircraft shall be procured through or by the aircraft prime contractor, rather than through a direct competition with the flight simulator industry. Some say this will preclude competition because the prime contractor will build the flight simulator or make a sole source selection of a subcontractor. It also is suggested that even if the flight simulator is competed, it will be more costly because the prime will add his surcharge. The other side of the argument is that this means Navy will deal only with the prime, who will have complete responsibility for the flight simulator as to cost, schedule, and performance. This will get the Navy out of the role of arbitrator when differences arise between the aircraft prime and the flight simulator prime. Do you have some comments on this and is this a matter that warrants Congressional oversight?

Mr. Battista

I'd rather DOD worked the problem out. In general, from where I'm coming from, I agree with you that you obviously have to have prime contractor interface here, but for the health of the program, I would suggest that it be funded under a separate line item, because remember where you stand priority-wise. The name of the game is build the F-18, get it through FSED; build the F-16, get it through FSED. And if there are any hiccups in the program, the first thing to go -- technical data package. Next thing to go -- simulator, trainer, all the ancillary equipment, support equipment, etc. So I think from the standpoint of your health, you're better off being funded in a separate line. Then you're not competing. I think you are going to pay more, getting it done through the prime, if you apply that as a general rule. We've seen that time and time again in areas other than yours. For example, the . . . -- the radar that goes into the LAMPS. No reason why we couldn't have bought that thing from TI and FGE'd it to IBM. Yet, we were letting IBM do it, tacking on an overhead plus a few other things of about $13,000 a copy to the prime of every LAMPS helicopter as a consequence of that management strategy. I think the same would apply here. You're going to wind up paying an awful lot in overhead, G&A, and everything else to get something that you could have bought substantially cheaper, had you had a prime interfacing with the guy who builds the simulator or the trainer. My general tendency is

to say stay away from the prime in terms of the development of the simulator. Let him interface with the principal contractor on that.

Mr. Old

The House Appropriations Defense Subcommittee in its FY 84 report stated that flight simulators must be developed and procured to integrate with the overall training program. This is, by the way, the report that's just been out a short time. It directed OSD to set forth clear guidelines for the development and use of simulators, and such guidelines should support any proposed simulator procurement in FY 85. The Committee also stated it expects all simulator procurement to be fully funded and that it be included as part of the overall cost of the weapon system it supports. Now, following up, Tony, should requests for flight simulators be included in aircraft line or should they be separate? You've stated your position that it would be better if they're separate. Should the flight simulator funds be prohibited from use for the aircraft unless approved by reprogramming?

Mr. Battista

No, the answer is you should have a reprogramming request.

Mr. Old

They shouldn't arbitrarily be allowed to take money that is designated for the trainer and put it into the aircraft.

Mr. Battista

There's really kind of an informal contract between DOD and the Congress, and every time that contract is breached, it makes Congress micromanage more and more. The Army one year, for example, was told not to spend any more money on the long path infra-red chemical detector project that they had. They changed the name of it and continued funding it for about six years after that. They lost a lot of credibility with the committee. It turns out that the . . . that they're building today bears no resemblance to the one they were working on back then, but there was a feeling on our committee that this should be killed, just to send a message back to them. Fortunately, it wasn't, because we decided that the guy on the battlefield needed it more than the Army needed a lesson in dealing with the Congress. But it's the same here. If you contract with the Congress to build a simulator, we don't think you ought to take that money and apply it toward the development of the aircraft. You ought to come back in with a reprogramming. Cost should be included as part of the overall cost of the weapon system -- of course. Isn't that one of Carlucci's initiatives, to represent cost more accurately to

the Congress? That was rhetoric, though. They proceeded to violate that before the ink was dry. But that's an honest way of doing business. What you see on that slide up there -- developed and procured to integrate with overall training program -- of course, why not? I can't quarrel with anything I see up there. OSD setting forth clear guidelines -- I would like to think that the Army, Navy, Air Force, and Marine Corps are a part of OSD and they do work cooperatively on that. And very definitely, I think these things should be fully funded. We're not kidding anybody. We're fully funding it, we're commiting to it, and everybody is aware at the outset that these are where the dollars are going. To me, that's good management practice. That represents good relations with the Congress. Good mutual relations.

Mr. Old

I thought, really, that's the way programs went to the Congress, anyway. I wonder why the . . . decided it needed some additional directive language?

This one was sent in to me early by someone that said Mr. Battista is an expert in VISIC. The Air Force is now developing VISIC -- Very High Speed Integrated Circuit -- and do you believe VISIC is going to require a simulation training system and if so, should such a training system be part of the VISIC development program?

Mr. Battista

Well, first of all, I am not an expert on VISIC, although our subcommittee did start VISIC.

Mr. Old

Well, you are, relative to the man who sent in the question.

Mr. Battista

We started the VISIC program. In fact, it started with a guy who works with Honeywell, now, Lin Weisburg and myself in my office, because there was an awareness at that time that the DOD was lagging dramatically behind the commercial sector in terms of using current technology chips, semi-conductor technology. If you remember back then, DOD's share of the semi-conductor market was like 7 percent. It wasn't that percentage that was alarming as much as it was the fact that we were building weapon systems that didn't really capitalize on the current state of technology. It's true in microcomputers today, for example. We're really behind the commercial sector. So we started the VISIC program in hopes of getting DOD into the 20th century, technologically, in microelectronics, and I think we've realized some good output

there. For about a $400 million investment, we now have 1-1/4 micron chips, the biggest problem being the cost. I think they're running somewhere between $2 and $5K a copy right now. So we're going to have to do a MAN-TECH program to get the price of these things down to, I would guess, maximum a few hundred dollars a copy. When that happens, I think we will have arrived. The next phase, as I see it, is sub-micron technology and I hope that phase will start pretty soon. My concern is that simulator training technology or systems are not a part of the VISIC program in terms of a proof of principle. Now, if I'm wrong on that, somebody correct me, but there is no proof of principle flight simulator or any other system that relates to what we're talking about here today. That's troublesome. I would like to see that and I'm going to talk to Maynard and Dick DeLauer about that if I am right on that. Yes, I do think that there's going to be a requirement to come up with a better interface simulation training between what you've got and where we are today in VISIC, to be very brief about it.

Mr. Old

Let me take a question from the audience now. How do you feel about joint Service development programs?

Mr. Battista

It's almost mandatory today because, as I said earlier, you had 10 yards of requirement and 3 yards of budget. I don't understand. First of all, I'm not a commonality freak. I don't like to see commonality across the board. I do not want the same Trident II missile as I have an MX. I want different birds because it's too important. I don't want two legs of the triad down at the same time. So I'm a strong advocate of different systems. But when we're as behind as we are today, quantitatively, and we don't have the Defense dollars to do everything we've got to do, what's the answer when the other guy is getting technologically better, as well? The answer is to have common developments, common procurements for example, joint procurements, and it's not happening. I can't understand why we would have to build two discrete radars for the JSTARS mission. The Air Force comes in and they said, well, we'd like to put this in the C-18, which is a 707. Now, you know that the 707 is not a survivable aircraft. It's a commercial airliner and you're going to have to either defend it or put it way behind the . . . The likelihood that you're going to put it behind the . . . is very high; therefore, you're going to have to have a different transmitter, different signal processor, different antenna, and it's not going to be the same system as the Army is going to put in its Mohawk. Does that have to be? To me, the answer is no. If the Army could operate close to the . . . with a Mohawk, why can't the Air Force operate close to the . . . with a highly survivable platform like a TR-1?

I get the opinion that the Services would rather do nothing, let the requirement go completely unaddressed, than embark upon a joint program. Now, we had a Defense Science Board panel on joint programs and they did what every good committee who doesn't want to get involved should do -- they said, we advocate joint programs, the OSD should advocate joint programs, but if the Services don't want to do them, then it's okay. Don't force them to do it. Now, you didn't make any enemies at all with that. But what did we accomplish, other than putting a lot of high-powered people to work for a long time to come up with nothing. To me, if we don't get on with more joint programs to satisfy common requirements, we're not going to get there from here. We're spending 1 percent, for example, right now, of the gross national product on Army programs and would you believe that we're falling further and further behind in terms of the capability of our land forces? We just can't continue like this. We're going to require more joint programs and the Services are just going to have to get together on these things. Years ago, I can remember, I developed the feasibility hardware for the Army's Copperhead projectile when it was called the . . . launch guided projectile. We could very easily have taken a sleeve, put it on the 5-inch projectile, shoved that thing through the 155 Howitzer -- which we did, by the way, no handling difficulties at all -- had a common round that would have killed any one of the 42,000 tanks that the Russians had at the time. Yet, we had two discrete efforts, we've got a 155 and a 5-inch, and the difference is less than an inch, and we spent a quarter of a billion dollars because of that difference. That's a lot of M-1 tanks that you could have bought by going with the common round. People come in and tell me about the new armor threat. First of all, I don't believe it. Secondly, if that threat is, in fact, a reality, then why aren't we putting that kind of technology in our M-1 tanks -- we're the leaders in armor technology, so I keep being told. But we really don't have our act together in terms of joint programs and it's going to have to happen and Congress is micromanaging, telling you more and more that you will go common with your other Services. For those of you familiar with the Air Force request for a voice com system -- the Air Force signed the Memorandum of Understanding with the Navy. They're going to help the Navy do sea control. Even with 600 ships, I believe that the Air Force is going to have to help the Navy do its sea control mission. Now, if you're going to have this MOU and you're serious about it, wouldn't it be wise to have your F-15s or your B-52s talk to the Task Force down below there? The Navy was going with JTIDs -- DTDMA -- the Air Force was going with . . . One is data, one is voice. They couldn't talk to each other. They couldn't talk to the Brits, who have already settled on JTIDs. That was $3 billion in discrete funds to develop a . . . system and deploy it. We couldn't afford it. Now we've got an enhanced JTIDs, which is a joint program between the Navy and the Air Force -- I hope. That's what they told us. But I'm telling you, the only way you're going to reverse the trend that currently exists, being outnumbered by the Soviets and soon

to be outperformed by the Soviets, is to embark upon joint programs. That's how you're going to get more return on your Defense dollar investment.

Mr. Old

Excellent answer.

Some say that Congress does too much directing in telling the Pentagon to implement particular program weapon systems. I think you kind of covered that. Let's press on.

Mr. Battista

Well, just remember -- you wouldn't have VISIC today if Congress didn't tell you to do it. You wouldn't have nuclear power in Polaris submarines if Congress didn't tell you to do it. You wouldn't have had the emphasis on shortwave length technology if Congress this year didn't tell you to do it. That's interesting. You can't find a guy in the Department of Defense who will admit that long wave length chemical lasers have better potential, military potential, than short wave lengths, but nobody was willing to come up and say let's modify the program; let's start focusing on free electron . . . lasers. .. . . . . what to do on emphasizing defensive strategy. But when it comes to the best solution, he's depending on his staff in the White House and in the Pentagon. So don't use that "it's in the President's budget bit" on me. I don't buy it. But yet it took the Congress to do that. That's not the way it ought to be done. The initiative ought to come from the Pentagon and the Executive Branch, and we ought to work with you on it -- not tell you what your requirements are, which is what we're doing very often, and giving you the right solution, which ultimately you tend to agree with. But it's really putting the horse before the cart.

Mr. Old

I wish you'd try to be a little more specific.

Do you think that you micromanage many of the Pentagon's programs?

Mr. Battista

Yes.

Mr. Old

And for the various reasons you've already stated.

Mr. Battista

But do we want to do it? No. I'd much rather leave earlier in the day.

Mr. Old

You know, the reports are getting thicker and thicker. It takes longer and longer to read those things and I guess it is because you're not satisfied with the justification and with the rationale you're getting from the Pentagon.

Mr. Battista

Yes. For example, first of all, we take input from everybody. I know last year there was a question asked about what's the role of the lobbyist? How well do we value his input? Are we willing to talk to folks in the industry? The answer is yes. Frankly, I want to talk to as many people as I can and I never make a decision based on a single calibration point. I get a different perspective from industry guys than I do from the guy in the Pentagon. I get a different perspective from the man in the field or the Fleet than I do from the Pentagon. In the case of the Navy, for example, I contend there's a Pentagon Navy and a Fleet Navy, and I put more credibility on what I get from the Fleet. Last year, for example, the reason we went to Beirut is because the Navy in Washington told us all was well -- they had all the equipment and readiness and sustainability required to carry out their mission. You had to be smart enough to ask, what is your mission. And it was to support the landing of the 32nd Marine Amphibious Unit unopposed. Well, the Nicaraguan Coast Guard could have done that. We wanted to know how much readiness we had, how much sustainability we had. And when we got out there, guess what we found -- two . . . systems onboard the Biddle, one being cannibalized since 1981 to keep the other one operational. They were flip-flopping back and forth keeping one on the . . . at all times. Less than an aircraft load-out of air-to-air missiles. What it boiled down to was that assessment -- we couldn't have done the job if we had had any opposition over there. So I put a lot of input on what I get from the guy in the Fleet. I put a lot of credibility on what I get from you in the industry and from the guy in the Pentagon, but I always make my recommendations based on a number of different inputs.

Now, if the consensus is we're not really addressing the Fleet or the field requirements as a consequence of what the Pentagon is proposing, then we'll jump in and micromanage. We'll put more bucks in for air-to-air missiles. We'll put more bucks in for O&M, in spite of what the Administration is asking for. Today, for example, in our report, if you pick it up, it says when are you going to start deploying the emerged technology --

the sensor-fused terminally guided submunitions, VISIC, all of this other stuff. Why don't you get on with it? Now, you've got a real requirement out there in the Air Force to kill runways and you've got no capability to do that today. You in the Army, you're terribly outnumbered, so you better go after the 2nd echelon forces and take away those reserves, those tanks and things. You, Air Force, you'd better understand that the massive density of SAMS out there is not going to enable you the luxury of flying in with an F-16, making four passes at the target area and dropping one Maverick missile to kill one tank because you're still outnumbered by 37,999. And more importantly, you're risking the life of that guy in the airplane and the aircraft itself. So why don't you take a T-16 or a T-22, fill it with submunitions, and talk about now killing multiple tanks, single pass, with a low value attritable delivery system. All we get back are the reasons why a T-22 is a little bit too heavy to go on an F-16. Yes, that might be the case. It might be a little too heavy, but so what! Take off with two instead of zero or instead of four. Because today you've got zero. And to build something else is going to cost you a billion dollars and we can't really afford it. So why not go with this capability. Hollingsworth comes in -- and we believe Jim Hollingsworth -- and he says the day of the white . . . flyer is really over until we can normalize the force structure on both sides. I believe that. My bosses believe that. So we have to tell the Pentagon now, go ahead and deploy the emerged technology by 1987. That's the wrong way to put it. They should come in and ask for more bucks so they can put this stuff in the field sooner. So, yes, there's a reason for it and I hope we can stop doing it in very short order, but I don't see anything happening to change that.

Mr. Old

In keeping with my promise to end at 11:15, I'm going to run a couple of minutes over, but I want to have just one final wrap-up question. It's not on the screen, but it's appropriate to what Tony was just saying. The Armed Services and Appropriations Committee members and staff have considerable tenure and therefore, a lot of corporate memory on DOD programs. Most have seen many turn-overs of key OSD and Service personnel, not to mention hundreds of program managers. Does this constant turn-over seriously affect DOD's ability to present its program, and do new people take too long to get up to speed.

Mr. Battista

Yes. I've been through five different Assistant Secretaries of the Army for Research and Development. The same with the Air Force. That turn-over loses a lot of corporate memory over there. Similarly in the military. A man comes in for two or three years. I've been through a lot of Deputy Chiefs of Staff

for R&D. We've got the corporate memory. I remember what you told me last year; I remember what you told me nine years ago about the requirement. And when I believe it and we agree on a program to carry it out, it's rather frustrating to have a new guy come in and say that's really not the best way to do it. That has led to what I call the 20-year development cycle. That is frustrating. Patriot, as we know it today, used to be called SAM-D. Used to be called . . . back in 1962. With 21 years in development of Patriot, we don't have any in the battlefield. And guess what. It goes away the first day of the war unless we upgrade it to give it a capability against the ballistic missile threat. In that 21-year time frame, take a look at what those technologically stupid Russians have done. SA-3, -4, -5, -6, -7, -8, -9, -10, working on the -11 and -12 right now. Twelve is an awesome system in terms of its capability. I wonder what's wrong with us when we spend 21 years working on something. If you started out as a 2nd Lt. working on the Patriot program, you will have retired this year without having seen the first one ever deployed. It's amusing, but it's frightening. To think that this technologically superior ability that we have keeps staying on contractors' shelves as opposed to being deployed. But I'm frustrated over the change and the constant turnover. The average guy on our staff has probably been there about seven or eight years. It's becoming a problem on the Senate side, too. You'd be hard pressed to find a guy on the Senate staff who has been there more than three years. In one way it's good. There are a lot of minuses to keeping a staff around a long time. We tend to get in a rut. I intended to stay there three years. I'm sure the Pentagon would have liked to have seen me meet that requirement. I've been there ten. I'll probably leave within the next couple of years. I don't intend to stay there very much longer. I'd like to think that I've got a good successor coming along. You want a turnover and fresh ideas. There is a proper balance, however, but I think the constant turnover that we've had has really had an adverse impact on our weapon system development process and, in fact, our fighting capabilities. The other thing is I think we place more emphasis, in writing a man's fitness report, on his ability to carry technology forward. The Air Force, I think, does the best job in that. They're the least, I think traditionally-bound Service. I see guys in blue suits in the Air Force who really can compete with anybody in the industry in terms of technological smarts. They're good. In some instances, they promote people on the basis of their technological background as well as their operational experience. I think the other Services have got to recognize that it's important for a man to have the right background to be able to deal with you folks in the industry, as well as to get out there and carry out the mission that Congress has defined for them on the battlefield or in the air. I hope that we'll pay more attention to that. There's also been a tendency on the part of the Services not to match the man with the job. I remember meeting a man in the Navy who was on Norm Augustine's staff who had a Ph.D. in

high energy physics. The guy who was running the Army's high energy laser program, I wonder if he even had a course in fundamental physics. This was in 1974 - 1975. Why couldn't we have matched that man to that particular job? We do it today, as well. I've seen complete mismatches in jobs versus qualifications.

Mr. Old

Ladies and gentlemen, this concludes our Congressional panel for the fifth Interservice/Industry Training Equipment Conference. We've enjoyed putting it on and we all owe a debt of gratitude to Senator Goldwater, Congressman Dickinson, and particularly Tony Battista, who stayed here and pressed on even though others failed us. Tony, thank you very much.

If you will remain here for a moment, John Todd will take the podium and has a few administrative announcements.

Mr. John Todd

If we could ask your indulgence and ask you to remain seated for a moment for some important administrative remarks regarding today's luncheon and the conclusion of the conference.

I don't think we can add anything to what Bob has already said, but certainly, I'm sure all of us are appreciative of the penetrating insight of Tony and the other Congressional panel members who favored us with their presence today.

Ladies and gentlemen, for lunch today we have Mr. John Marsh, Secretary of the Army. He brings us an important message and we would ask that all of you who possibly can honor him with your presence at the luncheon.

At this time, I'd like to turn the podium over to Mr. Paul Watson, Hughes Aircraft, Chairman of the NSI Logistics Management Committee, who has an important announcement to give you.

Mr. Paul Watson

Thanks, John. John threatened me with terrible torture and pain for every minute I overrun one minute of time, now that I've usurped the microphone. John, I'm ready to go hear the Secretary, too, so I'll try to be as brief as possible.

This time slot was requested to make you aware of some of the happenings going on all about us. We have screened these activities that we want to talk about this morning to just those that are of particular interest to those of us in this audience.

In that light, then, this time squib might better be described as previews of coming attractions.

The principal item of which you should be aware is the task order which was given to the Institute for Defense Analyses by the Office of the Secretary of Defense close to 1-1/2 years ago. Dick DeLauer asked IDA to lead a group of volunteer industry folks, plus representatives of DOD and OSD toward the goal of acting on the recommendation which resulted from the 1981 DSB Summer Study. Remember, that was the one that had the subject of readiness and the outcome had to do, to a great extent, with personnel problems. That was followed in 1982 by the 1982 DSB. The OSD IDA study was titled, "Steps Toward Improving Material Readiness Posture of the Department of Defense." The full task assignment was: Identify and provide support for high pay-off action which the DOD can take to improve the military system design, development, and support process so as to provide quantum improvement in R&M and readiness through innovative uses of advancing technology and program structure. That's one sentence. This task was given the short title, naturally, of O&M Study. There are eight case studies accomplished and many of us here have been involved in this. Sixteen technologies were reviewed. One of those technology teams was organized to examine the impact of manpower, personnel, and training on readiness. The thrust of this group was toward interactive systems influences of manpower personnel selection, human factors engineering, and training and the best means of dealing with these factors during weapon system concept and design in order to maximally improve readiness in the fielded system. That report has been submitted to OSD and on acceptance by MR&L, it will be available to those of us who are interested. If you'd like a copy of that report, there are some yellow slips of paper on the NSIA desk out in the foyer, and we'll keep you informed of the status of that report so that when it's available, it will be available to you.

Second item of importance is the long-awaited event. This community of multiple disciplines has long needed a publication to facilitate technical communication. The publication has taken the form of a training technology journal. The Editor in Chief is Tony . . . of Cubic; the Associate Editor is Dr. Ruth Weinclaw of Honeywell; the Assistant Editor is Melissa Harless of the Cubic Corporation. For those who have already subscribed, I have information that your copy is in the mail.

The last two items have to do with meetings. One of the meetings is the fourth annual conference on personnel and training factors in systems effectiveness. It has as an objective to explore the impact of recent DOD initiatives on manpower, personnel, and training technologies in relation to systems acquisition. It will be held at the Springfield Hilton, Springfield, Virginia, 1-3 May. Colonel Neal Cosby, Commander of Army Research Institute, and Mr. John Scott of the Sperry Corporation, are the co-chairs of that program.

The last item that I want to mention is the sixth Interservice/ Industry Training Equipment Conference, which is next year. This one is presently planned and I understand that Colonel Ball is going to say some words about that.

Mr. Todd

Ladies and gentlemen, at this time Colonel Gerry Blake, our Interservice Executive Committee Chairman, has a couple of brief remarks about this year's conference.

Colonel Blake

First of all, I'd like to ask Nelson Jackson to come up, if he would, please. He has a presentation to make.

Mr. Nelson Jackson

I think all of you know the amount of work that goes into these particular programs. You have been exposed and experienced many of the people who have worked on this year's program and I want to say on behalf of the American Defense Preparedness Association, we are deeply indebted to all of you, both government and industry, for what you have done for this year's program.

In this respect, we'd like to recognize particularly the conference chairman and the program chairman in a very small way. They and their companies and their management have made a tremendous contribution of time, energy, dollars, and I think that we, not only as an association but as a group and as a nation, are most appreciative and indebted to them.

To the Program Chairman, John Hammond, this says: Presented to John W. Hammond for his leadership as Program Chairman, Fifth Interservice/Industry Training Equipment Conference, Washington, DC, November 16, 1983.

To the Conference Chairman: Presented to John A. Todd for significant contributions to the enhancement of increased readiness through training as a Conference Chairman for the Fifth Interservice/Industry Training Equipment Conference, Washington, DC, November 16, 1983.

Colonel Blake

I don't have a plaque for him because he works for me, but throughout this entire process, Mr. Bob Swab, my Assistant Deputy, has been absolutely tireless in his efforts to help Nelson and John and John make this an outstanding conference, and I really appreciate it. Thank you, Bob.

Since this is my first conference, I don't have anything to compare it to, and mainly what I've been working on are the comments of the people who come up and tell me what kind of conference they think it is. From those comments, I have to conclude that we've had a really successful conference and I'm very pleased about that and in trying to relate to my participation in this conference, I guess I feel either like a paratrooper or O. J. Simpson. The team that has been working to make all this happen is my parachute or my offensive line. If either one of those had failed, do you know where I'd be? That says so much for the team that has been formed and the work that they've done to put this conference together and make it so successful. I thank everybody -- you for your participation and expertise, and the team for their hard work to make this an outstanding conference.

At this time, I'd like to recognize Colonel Jim Ball, USA, who will be the Executive Chairman for next year's conference here at the Washington Hilton in the October timeframe. He has a few words to say. Thank you very much.

Colonel James W. Ball

Thank you. We are about to run out of speakers, so we promise not to bore you with several more.

As Gerry said, I also have just finished attending my first conference as the new Army representative on the Board. I look forward to the sessions that we'll have this afternoon and tomorrow to try to learn from the very few mistakes that these guys made this year in putting together this conference, and I would be a little remiss, as the new stuck-ee for next year, if I didn't congratulate all of them for putting on an outstanding conference. My congratulations to all of you.

We do plan to have next year's conference here in this facility, 22-23-24 October 1984. I hope to see you here. We will be working with the National Security Industrial Association, NSIA, and we will try to squeeze as many exhibitors as we can into the constrained facility that we have. I understand this year they had several they had to turn down and I'm sure we will probably make some more folks mad next year by not being able to take everyone, but we will try to maximize the space that's available and get as many in as we can. We will try to equal or have a better conference next year, and this is going to be a hard one to top. I've been to many such conferences -- not necessarily with ITEC -- but it will be a tough act to follow. We accept that challenge and we're going to try to best what you folks have done this year. We look forward to seeing all of you here next year.

I want to now introduce to you the Conference Chairman for next year, Ralph Davis from the Cubic Corporation.

Mr. Ralph Davis

I would like to announce and introduce the committee members for next year. First of all, Exhibits -- Marty Morganlander; Publicity -- Bob Whitsell, GE Corporation; Publications -- Vic Facani, Singer Corporation; Facilities -- John Marsh, IBM Corporation; Program Chairman -- Rod Rougelot of Evans and Sutherland.

Mr. Rodney Rougelot

I'd like to present to you the committee that will assist me as Program Chairman next year. Don Campbell, from SAI, is going to chair the User Subcommittee. Next is Tom Sitterley from Boeing. Tom has the Technical Subcommittee. He'll be responsible for reviewing all the papers and selecting abstracts and so forth. John Todd will chair the Management Subcommittee.

I'd like to say, also, that these guys have done a great job from this year's committee and we look forward to the challenge and to seeing you all next year. It will require your help, your suggestions, and your comments. We solicit those now and look forward to seeing you all next year.

Mr. Davis

The final member of our team is General Tice, who is going to coordinate the speakers for us next year. He has been called back to active duty. He did call in today and say that he will still support us and be at the conference next year. To reinforce, we will be looking for quite a few volunteers.

Colonel Ball

Ladies and gentlemen, regarding the luncheon, the Secretary of the Army has an appointment with Mr. Weinberger at 1:00 o'clock, so when you go in at 12 for the luncheon, the Secretary will speak and he will conclude his remarks, at which time we will eat. That should speed up the process and we'd like to have you there to honor the Secretary of the Army.

Thank you very much.

LUNCHEON SESSION

NOVEMBER 16, 1983

Colonel Ball

. . . . . increasing trust and responsibility in both the private and public sectors. As a young soldier, he graduated from the physically-demanding basic parachutists course, then the Jump Master Course at Fort Benning, Georgia, and subsequently, earned the coveted Senior Parachutist Badge, which he also wears today, identifying him as an elite paratrooper. Following his law school studies at Washington and Lee University, he became an attorney in Strathsberg, Virginia, until he was elected to the United States Congress from the 7th Congressional District of Virginia, where he served for four consecutive terms. He was then appointed the Assistant Secretary of Defense for Legislative Affairs, followed by his selection as Assistant for National Security Affairs by then-Vice President Ford. He served in that position until he was subsequently named Counselor with cabinet rank to President Ford. Throughout his lifetime, his strong ties with the Army continued from his early days as a young soldier. His military service includes four years with the Army Reserves and he retired as a Lt. Col., Virginia National Guard, Stonewall Brigade, with over 25 years of National Guard service. Throughout his tenure in his current position, he has been an inspiring leader and spokesman who constantly demonstrated genuine concern for the welfare, training, and readiness of all soldiers stationed at various posts, camps, and stations throughout the United States and on the frontiers of freedom throughout the world. He also enjoys the singular distinction of successfully leading the Army through the largest force modernization program in the entire history of our Army, a subject near and dear to most of you here and one on which much of attention has been focused during this conference, while simultaneously overseeing quantum improvements in training, total force readiness, and increasing the overall staying power of our Army.

Ladies and gentlemen, please join me in welcoming as our third Secretary luncheon speaker, the Honorable John O. Marsh, Jr., Secretary of the United States Army.

Honorable John O. Marsh, Jr.

Thank you very much, Colonel Ball. I'm very pleased that I could have the opportunity to be here, because this group is addressing an area in which I have a very special interest.

I would thank General Miley for the great job that he does and the American Defense Preparedness Association, not just for

co-sponsoring and assisting in this conference, but in many, many other ways. I'm also pleased that my high school classmate, Joe Montalbano, Class of 1944 at Harrisonburg High School, could be here today.

To all of you, I would like to talk in what even might be a narrow range of interests within a context of what might be termed a very broad range of interests that impacts upon us all. I really want to talk about simulation devices, but in addressing that, you cannot address the question of simulation devices unless you address the question of why we need defense and what contributions can those kinds of devices make to a more effective defense, without being cognizant of the role that defense plays in the American scheme of things, as involves the well-being of our country, the perpetuation of the ideals and concepts of this great republic in a world that is very troubled, is very dangerous, is very changing, and is very complex. A world of crisis and violence, a world in which there's a very precarious peace and that peace is maintained by the power of United States strength. To the extent that United States leadership is weakened, then world peace is weakened. As President Reagan has said time and time again, we seek to deter war and we seek to deter war by maintaining peace through strength. That's a very noble goal that the President has enunciated, and those of us associated with Defense -- indeed, every American citizen -- can espouse that goal and work toward its achievement.

Yet, if you look around the world today, you see in Europe areas of potential problems, the Solidarity Movement that exists in Poland; you see the ominous number of Soviet forces that are arrayed there in the Warsaw Pact. If you look at the number of Soviet divisions -- 190 divisions -- a capability for the projection of power through the Soviet Navy, a modern, effective, and capable Air Force, you see all of these things that raise questions about the stability of the world today.

The Middle East, that was the cradle of civilization, is today a land of great violence and bloodshed. We see the tragic events that occurred in Beirut and those United States Marines that gave their lives to that terrorist attack.

In Africa, in that great continent, there is one of the major resource areas of the world, we find also political instability, wars being waged in various parts of that continent, excursions into Chad, border wars between various neighboring states, all of which have the impact of potentially being destabilizing.

In our own hemisphere, we see the encroachment from the island base of Cuba -- a base of adventurism. We see the valiant efforts of United States armed forces effectively to move into the Grenada situation for the rescue of American citizens and for

their protection, based on the appeal of neighboring states, and also we find that Grenada reveals other things that point to adventurism and aggression throughout the Caribbean and in through the Central and South American area.

In Afghanistan, we have over 100,000 Soviet combat troops that are in Afghanistan, have been in Afghanistan for a long period of time, and their aggression there continues as we meet here today.

Yet, we know that this aggression that we find in Southeast Asia, the tensions that exist along the DMZ in Korea, that all of these areas of violence are played out underneath an umbrella of nuclear terror and nuclear forces and notwithstanding this umbrella of the nuclear weapon, we would have to say that the cutting edge of aggression is still likely to be a guerrilla soldier or an infantry soldier who is employing conventional weapons and the tactics of ancient land warfare.

Which brings us into the area that I would particularly seek your help, your ideas, your suggestions, and draw on the enormous resources that we have, a great American resource, in American industry to meet some of these requirements.

The modern battlefield is going to be an unusually dangerous place -- not that battlefields haven't been that way in the past -- but the modern battlefield will be very fire-power intensive. It will be electronically and communications intense. It will exploit high technology, both in the electronic field and it will also exploit technology in the field of smart weapons and smart munitions. It will be a very lethal place and it also will be a very expensive battlefield because modern weaponry is expensive.

When we talk about high technology and the skills of our young people in the high tech field involving computers, I think that's a very good thing but I'm not ready yet to concede that Pac Man can be depended upon to save Western Civilization. If you were to look at the highest priority of your Defense establishment, in a single word it would be readiness. Now, if you address readiness in any of the Services -- and this is especially true in your Army -- you would see that it falls into two greyed areas that you would have to discuss. First is people. There is the readiness dimension that relates to the human element, to people. And when you begin to talk in terms of people in the force and soldiers, that breaks down into two dimensions. First, you need individuals who are trainable, meaning the quality of person that comes into the Armed Services who can be trained and has the mental and the physical capabilities to handle military training. We are meeting that people requirement in the Army. Last year, the year ending September 31st, 1983, for that year the Army recruited 88 percent high school graduates and well above 60 percent were in the upper half of the AFQT test, meaning that they were above the average

mean of their cohort group on the American scene in intelligence testing. So we think that we're meeting that people requirement, which is the first dimension of readiness for individuals. The second dimension for readiness for people is effective training. Effective training -- and that's what I want to talk with you about and this is where I seek your help.

Going back to the underlying premise that weapon systems and their costs in actual operation and firing are extraordinarily high in many instances. I said the first dimension of readiness is people and that's the base on which you must build. The second dimension of readiness is weapon systems. Weapon systems that are effective for the purpose for which they're designed and secondly, are in adequate supply for issuance to using troops.

Once you move into the dimension of readiness for weapon systems and weapon systems that have the capability that you need, then you move into force modernization programs. Force modernization programs must take advantage of recent advances in state-of-the-art in the field of technology. Secondly, there must be, as a part of that program, the replacement of equipment that is in the inventory that is obsolete, either by use or by new design. These requirements also are expensive.

This brings us into the field of simulation. I've had an enormous interest in simulation for some time and am urging the Army to give it very close attention. We need simulation, one, for cost, which I spoke to, but secondly, we need effective simulation devices because many of the weapon systems that we have today impose significant requirements on range utilization, for example, and they have other training limitations. The mobility and the communications capabilities of today's modern army are such that with weapon systems that have the ranges that they have, we begin to get into some very severe limitations in employing them in their tactical mode. We must address that and offset that through simulation.

A couple of years ago I went back to my old National Guard Regiment, the 116th Infantry, Virginia National Guard, the Stonewall Brigade. They were training at A.P. Hill. There was a youngster there who was sitting over in the brush with a Dragon anti-tank weapon. Now, one, he had no simulation device on it; it was a very hot day; he was sitting there behind the Dragon trying to sight it. I looked and I noticed that he was sitting in poison ivy. Now, you know, they say experience is what you get when you're looking for something else. That Dragon gunner didn't get a lot of experience out of that unloaded, unfirable Dragon, but he did get some experience about poison ivy. I watched him and I thought about the difficulties of his task. Down range a tank was supposed to come upon the horizon at about 800 yards. Part of the drill was that he was to simulate firing at the tank, hit the tank,

stop the tank, and if he didn't do that, then the tank would come around on the flank and would get into the ranks of the infantry and would raise havoc with the defensive positions. The tank comes across, he tracks it, he imitates the sound -- bang -- the tank, of course, just kept on going. It came on around, got into the formation, an umpire went out and said, "You're not supposed to be there, you've actually been hit." Then you get into all kinds of debate -- no, you didn't hit me; yes, I did. If you've been involved in any military training, particularly Army training -- Hank Miley, I'm sure, has seen this time and time again -- the debate that goes on between opposing units because they could not simulate the actual tactical training that they're undergoing.

It seems to me that there are really two greyed areas in simulation that need to be addressed, recognizing that there's going to be shades of grey between the two types. One type of simulator device we need is the field training simulator for the incident I just mentioned, the use of the Dragon gunner. Also, for the infantryman in the use of his rifle, the field artilleryman, the mortarman, the use of the mortar. Secondly, there is a great field of simulation devices that I call the classroom/workshop/laboratory type, and by this I'm referring to sophisticated computerized simulation devices that you would use in training pilots for helicopters or of the nature, as an example, the Link Trainer.

The reason I mentioned these two types of devices, what we really need in the Army are those field training devices, and don't drive us off the field into the classroom, into that type of an environment. I recognize there are areas that you have to go into the large classroom/laboratory type facility, but please bear in mind in the Army are simulation devices in the hands of individual soldiers.

We very frequently get the question, can today's soldier handle modern technological equipment of the type that you're bringing into the inventory? My response to that is that the individuals that we are recruiting into the Army, with 88 percent high school graduates and 60 percent of them above the average mean on the intelligence testing, are drawn from the American scene. They're drawn from a cohort peer group. And the devices that we use in the military services have their origin, by and large, in the civilian community and they have their counterparts in civilian application. People of their age group who do not go into the military are put onto these types of equipment in their civilian modes and successfully operate it, and so it's very clear and we can show that today's soldiers, sailors, airmen, and marines can operate this type of equipment. But we need simulation devices in order to accelerate the learning process. That's a very important thing when you talk in terms of training individuals for 8 weeks in basic and x number of weeks in advanced individual training. To the extent that we can accelerate the learning process

on modern, sophisticated equipment through simulation devices, we will have had enormous achievements.

But then you get into the question of the cost. A rifle round, 5.56 mm M-16 round costs 19¢. A 105 mm high explosive artillery round is $169. A 155 shell is $149. But an 8-inch smart munition, meaning improved conventional munitions and often referred to as smart munitions, that 8-inch round is $1,069 every time you fire it. A 155 very sophisticated, highly effective, enormously effective round, the Copperhead, $54,000 a shot. A Dragon round or a Dragon missile for the infantry gunner, $4,000 a shot. A TOW round, $9,686 -- roughly $10,000 a TOW shot. The Red Eye anti-aircraft, $8,000. Hawk, $36 million a shot. Patriot, $74 million. Flying hour for a Cobra, $710.

When you begin to see those costs, you begin to see two things. You see, one, limitations on training because of costs, and two, limitation from the standpoint of budget consideration, that is, not being able to have adequate funds to place those types of weapons for actual training use at the units and at the levels that you would like.

For those of you who have followed very closely Army programs, I would invite your attention to the National Military Training Center, where we place enormous emphasis on simulation devices at that facility at Fort Irwin, California. One of the areas where we have had great success, not just at the Military Training Center but in other training units around the world where our units are stationed, is a system called the MILES. I suspect that there are representatives here in this audience who are associated with MILES. You cannot have a program in the Army unless you have an acronym. You get the acronym and then you get the program. But MILES means Multiple Integrated Laser Engagement System. The MILES is the breakthrough because you use a laser device attached to the infantryman's rifle, you put a receiver device on a harness on opposing infantrymen, and you can fire at one another and if there's a hit, the signal goes off on the harness. The individual cannot cut that off himself. An umpire has to come and cut it off with a key. He's a casualty. He's moved out of the tactical exercises. I invite your attention to that because it is an enormously effective device because what happens when you introduce those kinds of combat training techniques is that you do a couple of things. In addition to the defensive unit that is using that device, knowing that when they fire at someone whether or not they hit them, you find that units that are engaged in the tactics of seeking to carry out the offense, once they really realize that what they did was wrong and they exposed themselves or they ran to the wrong place, they did not camouflage themselves adequtely or did not take adequate cover, consequently they're hit and would have been a casualty, you take them and run them back through the same exercise and they do it much more skillfully and much more carefully because they recognize that they had engaged

in some very bad combat practices, which, had they been in actual combat, they would have been a casualty, either wounded or killed in action.

These are the types of things that I would like you to think about. I have tried to list what I think are some of the criteria for training simulation for the Army today for units seeking field simulation. One of the things we need is improved simulators to give area weapons effects. This has come out of the National Military Training Center. For example, we need simulation devices that show to the infantryman and to the combat arms soldier incoming artillery. Incoming artillery sounds a lot different than outgoing artillery, too. What we need is to simulate mine explosions, chemical/biological type weapons on the battlefield. We need different types of simulation devices other than things that I just talked about, like MILES. At the National Military Training Center we're trying to develop an incoming artillery simulation.

We need simulation, obviously, for these highly expensive weapon systems like the Copperhead and the Hellfire. But if you were to say what it is that should be the guideline -- and you can refine these and maybe some of mine are wrong -- it would seem to me that in addressing what you should produce, there should be a realistic replication of the firing and the targeting of the system or the operation of the system in the event it's a laboratory type of thing where you're duplicating the Apache or the Cobra or this type of thing. But if you're talking about a weapon system that fires, you must get the reaction and the realism of firing this system and you must also know whether or not you were successful having fired it. One of the problems in firing with wire guided missiles, the recall and explosion throws the gunner off. It throws his eye off the sights because it's wire guided and if he does not hold steady with his sight picture and let the dust and everything settle, he will have already distorted his aim. So what you have to do is reproduce some of those effects because the only way you can teach him to do that is to do it time and time again. Yet, when you're firing a missile that costs several thousands of dollars, you can't do that.

The simulator cannot be any more complicated than the system that it seeks to simulate. It must be an effective training device for the individual who uses it. It must be effective for him. It must be soldierized and it must be durable. It must achieve a substantial cost saving and yet be able to be obtained at a reasonable cost. If it costs you $10,000 to fire a system and you produce a simulator that fires for $1,000, that's cost effective as far as reduction, but you still can't use it because $1,000 would still be too high.

The system must be combat credible. It must be available on a wide scale and it must be safe for the operator and the other

players. An area in which we need help and assistance, which I think is a field, is in state-of-the-art computers to support war games for commanders and staff in the field environment. We need low cost, portable, individual skill trainers for maintenance, supply, and field tactics. We need, also, the development of certain laboratory or classroom type of simulation in the field of robotics, speech recognition devices, signal intelligence, and electronic warfare equipment, to name just several.

These are not an exclusive list. They are simply examples of some of the things that we need.

I mentioned to you that good simulation will have a dual affect. It will be an effective training device to teach how to operate the system, and it will also impact very importantly on the individuals and the unit tactics against whom the system is directed.

Now, what's the pay-off? I said to you that our goal is reainess. That's what we seek to achieve and we can only obtain it, one, through the individual, and two, through the weapon system, and three through effective training. But there's a big pay-off in effective training and that was demonstrated by the First and Second Battalions, United States Rangers in Grenada, and 82nd Airborne Division in Grenada. I'm very proud of them and they do a good job, and they bear testimony to the kind of training that those young soldiers are getting. Every American can be proud of the job that they did down there. Also, remember that by and large, those individuals who were introduced into that combat environment were being introduced into a combat environment for the first time. That performance speaks remarkably well for their training, because only through very intensive, effective training can you take individuals and introduce them into that type of situation and have them excel in the manner in which they did.

The world in which we live is a very troubled one that places demands on every American and it places great demands upon you. In Edinburgh, Scotland, in the Sunken Gardens of Edinburgh, along Princess Street, is this quote from a monument that honored a great Scottish regiment: It's not for glory, nor riches, and neither is it for honors that we fight, but it's for the sake of liberty which no man loses, save at the cost of his life. Let's remember that quote and let's preserve liberty in this country and let's preserve it by having the most well trained, effective force this nation has ever produced in order to maintain peace and deter war.

Thank you very much.

Colonel Ball

Secretary Marsh, on behalf of all of us, thanks so much for taking the time from your obviously busy schedule to come share these enlightening and inspiring remarks with us. From all of us, best wishes to you as you continue to lead and build our Army in the future. Thanks again for coming.

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