INCIDENTAL PAPER

Seminar on Intelligence, Command, and Control

Information Technology and Organizational Agility
Charles J. Cunningham

Guest Presentations, Spring 1999
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June 2000

Program on Information Resources Policy

Center for Information Policy Research

Harvard University

The Program on Information Resources Policy is jointly sponsored by Harvard University and the Center for Information Policy Research.

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ISBN 1-879716-63-1 **I-00-2**

Information Technology and Organizational Agility

Charles J. Cunningham, Jr.

In January 1999, Lt. Gen. Charles J. Cunningham, Jr., USAF (Ret.), became acting deputy assistant secretary of defense (intelligence) within the Office of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (OASD C³I). He retired from the USAF in 1987, having served for 33 years in operational assignments at every level from squadron pilot through commander, 12th Air Force, and positions in the air staff ranging from action officer through deputy chief of staff, Programs and Resources. After leaving the military, he joined the Mowell Financial Group and Reflectone, Inc., eventually becoming president and chief operating officer of Reflectone. When Reflectone was acquired by British Aerospace PLC, he became director of the Center for Ethics and a faculty member of the College of Business, University of Tampa. From January 1991 to October 1994, Lt. Gen. Cunningham was the commandant of the Defense Intelligence College; thereafter, he was assigned as chief Defense Intelligence Agency (DIA) liaison at National Defense Headquarters in Ottawa, Canada. In October 1997, he became DIA senior regional representative in Europe, and in September 1998, special assistant to the senior civilian official, OASD C³I. Lt. Gen. Cunningham is a senior fellow at the Armed Forces Staff College in Norfolk, VA, and a war studies fellow at the Royal Military College of Canada. He has received numerous military awards and civil service honors that include the Presidential Rank of Meritorious Executive and the Defense Intelligence Director's Award. He earned a B.S. in political science from Florida State University, an M.S. in business administration from George Washington University, and a doctor of public administration degree from Nova University.

Oettinger: Mr. Money couldn't make it. He has a bad case of the flu, but we are very fortunate in having General Charles Cunningham with us today. I've had the pleasure of several years of collaboration with him during his stint as commandant of the Joint Military Intelligence College (formerly the Defense Intelligence College). I welcome him here as an old friend as well as the current incumbent as deputy for intelligence in the Office of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (OASD C³I). The first thing you might do is explain just what it is that makes the assistant secretary these days a senior civilian official (I think that little bureaucratic twist will be of interest), and then shift into whatever substantive realms you care to engage in.

Cunningham: Good. First of all, it is an honor to be back here and to come to Tony's class. Tony was a great help to us at the Joint Military Intelligence College, which grants the master's degree now, as well as a bachelor's degree. Are you still on the board there?

Oettinger: I chair it now.

Cunningham: Under his tutelage, we've come a long way. And so, it's really a tremendous pleasure for me to be here.

Now, it is one of those marvels of Washington pragmatism that the ASD C³I is a senior civilian official. To be the assistant secretary of defense you must be confirmed by the Senate. Art Money, who is a great American and had served admirably for almost three years as the person responsible for acquisition in the Air Force secretariat, was invited by DEPSECDEF John Hamre just about a year ago (in fact it was the second week of February last year) to take his current position, the C³I assistant secretary's job. So, why is it that he is not the assistant secretary and why is he the senior civilian official? "Senior civilian official" is a euphemism for a fellow who operates with all the

authorities and responsibilities, but does not have Senate confirmation. And why doesn't he have Senate confirmation? Because he has not even been nominated by the White House for such a position. Why is that? The politics are really murky, and I am not knowledgeable enough to get into that.

Let me add that I am Art's deputy, so I am the deputy assistant secretary of defense for intelligence. But you cannot be involved in intelligence without being heavily involved in command and control kinds of things. I think we all understand that. Nor, these days, can you be involved at all in command and control kinds of things without somehow being involved in intelligence and/or space, in the military sense. This business all begins to wrap together, which doesn't surprise any of us because that's the way the information age is: everything gets wrapped together. Is that a good thing? I think it's a very good thing. Trying to understand it, of course, is another matter. That's why we turn to such people as Professor Oettinger.

Now that we are in the murky business, we can talk about C^3I. First of all, I'm just going to try to go through some things here that may serve as boilerplate in the C^3I side of intelligence. I want to hit some of these major points to be sure that they're covered, and then I'm at your service or mercy, or however you'd like to have it.

If you want to interrupt me, go ahead and do that, especially if there's something you don't understand, because people who come from the Pentagon speak a strange language. I've only been there five months on this trip, but I noticed that when I went back in there. I had to go sit at a table kind of like this at Art Money's meetings and try to look as though I understood what they were talking about. I must say that I was clueless for about three weeks because of all the acronyms. I knew the programs pretty well, but the acronyms just went right by me. Then they're linked together like nouns and they even have some verbs that are derived from acronyms. After a while it's total confusion.

First, some thinking about C^3I in military operations. It's important from the context of the Department of Defense to think in terms of military operations, which span everything from periodically leaving garrison to help with humanitarian efforts, through peace or trying to reestablish peace, all the way through full combat. There's a whole lexicon that goes with this. The whole effort here is to keep from having to engage in violent warfare. That's to be avoided, and that's why we have a standing force in the first place. The defense establishment is becoming more and more comfortable with these other kinds of missions that fall upon us with the change in threat after the demise of the Soviet Union.

So in this context of military operations, I just want to say a few words about information age considerations: some things that strike me as I've looked at it especially hard over the last five months. The Revolution in Military Affairs (RMA) is always sort of catchy. Is there going to be an RMA? What's it going to be? We don't have a clue what it's going to be, and that's why it will be a revolution. But there is a way of thinking about it that Jack Gansler, the under secretary for acquisition and technology in the OSD, Office of Secretary of Defense, has begun to look at. I'll talk some about that.

Then, very quickly, I'll get into intelligence and the operational art. When I say operational art, that is the way military people go about employing force in the profession of arms.

Information age considerations. Information technology (IT) is a wonderful enabler. We're only scratching the surface of where this thing will go. Everybody in this room is a student of that. We're trying very hard to learn what we can do, but we know how we can be enabled. There are a few penalties to be paid along the way: adjustments that we have to make in our culture and that sort of thing. We're finding that is certainly true in the military. What can be achieved by information technology in the information age is tremendous, and it will change a lot of what we do.

The threat that we're dealing with, as we're better enabled by IT in this age of information, is extremely complex. I will not be one to sit here and tell you that it's a lot harder than it was during the Cold War. I was there. It was *hard*. Armageddon was right around the corner. That happens not to be exactly the case today, and I think that is a major shift. It is very complex, true. There are all kinds of transnational threats. Weapons of mass destruction are indeed on the

loose. That is disconcerting, at best. But we have a kind of breather during this complex situation.

As information technology explodes—as the half-life of any given baseline, if there could be such a thing, grows shorter and shorter—interoperability, just by the nature of that, becomes more and more difficult. At the same time, technology helps to solve its own problems. So there's a certain orchestration that has to take place here. It wouldn't be a bad idea to use a scientific method every now and then. I happen to observe that is not used very often in the military approach to these kinds of things. In fact, logic often escapes us. I'm not sure that's much different in industry or anyplace else. I do know that all too often it's the case in the defense establishment. It's what drives policy people crazy. We're looking for things to be done in a more logical way. We're looking for things to be done in a more orderly way. We would like to see more deployment flow charts to define process, rather than word charts that don't tell us anything.

It's hard to get there, though, in a culture that just wants to move forward fast and at the same time does not have to produce a statement of conditions or a balance sheet. In the defense establishment there is that business of, "Well, I could do this; just give me the money, boss." So, we're fighting to get more rigor into that.

There's a dawning appreciation in the information age that agility must be a way of life. Here, when I say agility, I'm thinking of it as Goldman, Nagel, and Preiss do in their work at Lehigh University in the manufacturing systems engineering program. If you haven't read *Agile Competitors and Virtual Organizations*,[1] I urge you to do so. Don't buy it. It's about 555 pages. Go to the library or call it up or do something like that, because there are about three key parts of the research that are extremely instructive. Unless you want to examine the research, avoid the book. Just go to the parts you really need.

It does, though, make the case for being agile, in the private sector sense and in the business sense, which is applicable to the public sector. Okay, Chuck, tell me what you mean by being agile. Agile is like Nike. Nike is agile. Nike is in touch with its customers (or has been; I've noticed they're starting to lose touch a little). Nike has a communicative relationship with its customers, pays attention, and picks the parts that it wants to respond to. It does that very well and very fast. Honda is similar. If every single person who bought a Honda car wants a different one, Honda's capable of giving them a different one. It's just what comes with robotics and information technology. You can do those kinds of things, and you can do them fast. That sort of defines agility. We have to be the same way in what we do in the operational art. That's one of the things that comes to us with the information age.

Now, there's a lot of talk about the RMA. It's exciting, it's enticing, and all of a sudden there's going to be some earth-shaking thing. Like what? Are there any infantry people in here? Take a large maneuver force. When countries could field, equip, train, and indoctrinate units that could maneuver in certain ways and bring firepower to bear in a concentrated fashion, et cetera, that was kind of a revolution, as opposed to just doing it in a disorganized fashion. There's a classic example: Napoleon was very good about that—marshaling forces, bringing them together, being able to move them rapidly, positioning them to the best effect, signaling—all those kinds of things. That was a revolution.

Tanks were a revolution. Everybody knows the story of General Patton and the way tanks were brought onto the field and what that did to horse cavalry. Airplanes employed in mass bombing and air combat, ugly as it is, was a revolution. Classically, nukes were an RMA; it was ugly, but it was a revolution.

What is the next revolution? I don't know what the next revolution is, but Jack Gansler makes the point that you're going to find the next RMA by watching the revolution in business affairs. This is the information age context. This is IT based. This is "developmation" thinking. Jack Gansler goes so far as to say: "Indeed, the doctrine, tactics, techniques, and procedures used by the mili-

[1] Steven L. Goldman, Roger N. Nagel, and Kenneth Preiss, *Agile Competitors and Virtual Organizations: Strategies for Enriching the Customer*, New York: Van Nostrand Reinhold, 1995.

tary will be driven by the revolution in business affairs."

What kinds of things go with the revolution in business affairs? Short cycle times; modeling-based acquisition; the ability to work your logistics differently because of the information systems that you have available. Some would say that, although it's a two-edged sword, the just-in-time logistics has been something like that. Those kinds of things affect what we do militarily in the operational art, and they're information age, IT based.

Student: Could you expand on what you mean by short cycle times?

Cunningham: A classic example of short cycle time would be that if you want to acquire a major military system—like a weapons system, or maybe a fighter airplane—it will take you 8 to 10 years to get there. You can't work very well with that when, first of all, the half life of technology is so short. It would drive you down to two to three years, which might be a reasonable time, or a competitive time.

By the way, competition is a big part of this. Cycle time has to do with how long it takes you to make your decisions. Information technology helps us reduce that tremendously. Classically, whether you're in a commercial venture or in a military operation, if you're in competition, your goal is to be inside the cycle time of your competitor. Now, that assumes that you're going to make a better decision. If you make bad decisions faster, you're only in bigger trouble. We know that. But for equal quality of decisions, if you are able to realize your decisions faster than your competitor, you should outperform that competitor. Those kinds of things come into play in your appreciation for short cycle times and enabling you to operate that way.

Student: You mentioned parallels to previous RMAs, such as mass mobility of forces and the use of air power. The massive movement of force and troops, or the use of bombing by airplanes, don't seem to be direct analogies of anything else occurring in commercial life at the same time. Why do we look to business now?

Cunningham: We look to business now because of what we see happening in business now. I think everybody here probably read the Tofflers' book on *War and Anti-War.*[2] What do the Tofflers tell us? (I happen to think they were right.) Developed nations will make war the way they make their money. That is what has changed. Actually that didn't change; the Tofflers told us that's the way it was before. It changed with the advent of the industrial age.

Now, the context of that's a little bit different than Gansler's usage. I wasn't citing those little humble examples of revolution in the Gansler context. So there's not a direct relationship there. But it does hold that if you think about the Tofflers, if you're able to accept that we're going to make our wars the way we make our money, it makes us say that we're going to do things a little bit differently. We think about things like bombing as kinetic solutions. (We now have this glib way of saying "kinetics.") That could change for a lot of reasons, and that brings me to intelligence and information in the operational art.

Intelligence, of course, can be data, but the way I think of data, it's not intelligence. When you start manipulating data to make it more meaningful, it becomes information. When you're trying to learn something and you set out a way of collecting data and information so you can put together a context, and you can postulate a condition, and then you can prove it via corroboration, it becomes intelligence. We call that finished intelligence.

With IT and with the information age and with all that's happening elsewhere in C^3, we are able to run all this much faster than we used to, collect in a much more elaborate way, integrate better, and disseminate better. That happens to be both a blessing and a problem. We have a serious problem because we have people who specialize in collecting information or data; we have people who specialize in analyzing it; and we have people who specialize in distributing it. Very often, those groups of people will tend to work

[2] Alvin and Heidi Toffler, *War and Anti-War: Survival at the Dawn of the 21st Century.* Boston: Little, Brown, 1983.

pretty much in their area. We must work in a much more coherent fashion now and that's why, at the same time, we have to think about what our technical and our processing and our exploitation and our distribution requirements are. In fact, we have a good Pentagon acronym for that: TPED. We have to start to think in terms of TPED.

Who makes us think in terms of TPED? Congress makes us think in terms of TPED, because when people go to the Hill now and want to get money for a collection system—let's say an overhead system, a satellite of some kind—Congress wants to know, "Okay, sir, how does that fit together? If there's that much for collection, where is the part that's going to do the processing? Where's the part that's going to do the exploitation? Where's the part that's going to do the distribution?" You can no longer throw this right over the transom and have everybody be happy with it. People are more informed, more sophisticated, these days. They say, "So what is the output?" "Where's the business concept?" "We've heard the input, but where's the rest of it?" I think that's very useful. It's challenging to us, and therefore it's healthy.

Within this whole context comes something called information operations. Here we have command, control, communication, the ability to collect, and then we go over to intelligence, and down to information operations. Everybody in here has heard of information operations. Information operations mean that you protect your information, and you develop the ability to find out your opposition's information. (This could easily be in a private sector competitive situation as well as in a military environment.) So, you want to move your information fast and effectively and protect it, and be able to threaten and get the other's information.

We've classically thought about things like command and control warfare. The idea that you could use deception is always a part of it. You could destroy a person's or an entity's ability to communicate. You could practice psychological operations. Naturally, you would pursue your own operational security; we call that OPSEC. Finally, there's electronic warfare (EW), where, for example, if you are going to operate a weapon system in the air, it's nice to know how that weapon system is threatened. Where are we seeing that now? In the no-fly zones, aren't we? What kind of solutions are we now using for the EW threat, or the missile threat that is electronically guided?

Student: Jamming?

Cunningham: We're using jamming. But what are we now doing when they come up? We jam them to protect ourselves; then what do we do?

Student: Kinetic solutions.

Cunningham: Then we use the kinetic solutions. That's right. How easily we adapt ourselves to them. The kinetic solution is the solution of choice, if you will. But information operations say, "Well, maybe there would be other ways to do these things."

Student: When I said kinetic, I meant bombing it.

Cunningham: Yes. Explosions. Blast, heat, smoke, dirt, and all that stuff. The ugliest way. Would there be another way that you could do things? We all know about that. We read about these things. We understand that there are ways to get to people's information. It's happening to us. Probably not one of you in the room hasn't felt the effects of somebody doing something, maybe on the Internet, to you personally, or to somebody, or found that you now have to screen for viruses all the time, et cetera. We're affected by this. People are trying to get to us. They're not blowing our computers away, but they're trying to get in there maliciously or for fun or for whatever, and we don't want that. We want our privacy. We want to protect ourselves.

So, command and control operations, going beyond those five classical ways, warrant information operations enabled by information technology, and that puts us on the threshold of a new way of employing force, getting our will by force in the Toffler sense. There is a new way to do this.

Now, how much of that are we doing? I think we will know how much of that we are doing when we start buying fewer bombs. I haven't noticed us buying fewer bombs

lately. But when you see us buying fewer bombs, fewer bomber airplanes, fewer tanks, et cetera, you will say, "Ah. There must be another way to do this work," because whatever nation we are, we're going to protect ourselves, and we're going to be able to ensure that our vital, our fundamental national needs are taken care of.

I would just like to leave that there. Now we have a pretty good amount of time remaining. We could just have an open discussion if that would be all right.

Oettinger: Would you say a word about information superiority?

Cunningham: That's good. Information superiority says, "Look, if we're in this information age, and if we know that it's so important to be inside an adversary's cycle time, et cetera, don't we have to be superior?" We've gone a step past that. We've said that now one of the goals for 2010 is to be information dominant; in fact, dominating in information. Dominance implies that you can even be intimidating by your own ability to protect your information and to get to others' information.

Would we ever dominate for other than good cause? I would say we would dominate to protect our vital interests. As long as our interests are good, then it would be for a good cause. I would hope our interests would be good, but I would never guarantee that. Our history doesn't guarantee that.

So, superiority and dominance are extensions of what basic information operations imply. They have to do with being able, in dealing with other developed, sophisticated entities, to protect your information better, get to their information, exploit their information, and achieve your will via information means. That's the way I think about it. Does anybody else have another view?

Student: Actually, I was a little intrigued, going back to the short cycle time, and I was wondering if that's a viable argument for the budgeting challenge that you presented to yourself, especially in light of the political environment that says, "Do more with less." Will you go back and say, "Well, we can't; it's just the nature of the beast."

Cunningham: In fact, if we would be realistic enough—and you used the right word—"to do more with less," and to accept that as a requirement, indeed, we shouldn't fight the semantics here, we should just say, "Okay, we're going to do more with less." Now, that is a task! How are we going to do that? One of the ways to do it is to shorten the cycle time. Here's what happens to the schedule. Have you studied business at all?

Student: A little bit.

Cunningham: Then you know when you budget that your budget is expended over time. If you can achieve that task in less time, what happens to your budget? It's not always, but it's usually less. Why? Especially where you have human involvement, which is almost all the time, you march that army less. Now, for certain, if your project has X years to it, and therefore your budget is for X years, and you change that to X +1 or X+2, we know what happens to your budget.

What is the track record in government with regard to programs and projects? Do they ever come in shorter or do they have a natural tendency to extend longer? They have a natural tendency to extend longer. By the way, that isn't just in government. Tony could regale us with information technology endeavors in the private sector that have gone on longer than was, in good faith, originally thought to be the case.

Oettinger: Including this university.

Cunningham: Even in this very university. So the constant fight to shorten your cycle time makes you do a lot of things that will make you more efficient. It's just the natural assessment of being able to look at a budget over time and measure trade-offs if we did *this*, or if we applied *that*. All of the ideas that came 30+ years ago with program evaluation and review techniques (PERT) were intended to tighten your cycle time.

Oettinger: That's a favorite example of mine, because PERT—which was a product of the Navy in connection with the Polaris missile program—probably bred over its lifetime (and for all I know, it's still going on)

more lying and thieving than any other single management tool I can imagine. The whole idea was that you were going to manage a project by having this chart which showed the choke points (I forget what the jargon was)—the critical path—and you got greater project efficiency. The proof of that was the way that the Polaris program, which Admiral [William F.] Raborn headed up, brought in those missiles. You triggered me, because I did some research on that in the days when I was working for NASA, and the truth of it was that the PERT system was used by the Polaris program managers as a Potemkin village to throw snow over congressional investigations. The way it really was run, it was a good program, but PERT had nothing to do with it. What it had to with was that the program managers were on airplanes going from site to site, working 24-hour days, and old-fashioned seat-of-the-pants management. But the myth was uncontrollable, and then for many years (for all I know still today), every damn Navy contract had to have its PERT charts, which added 5 to 10 percent to the cost of managing the programs. Admiral Raborn, for his success in doing this, became director of central intelligence (DCI).

Cunningham: This is getting worse! This is not getting better.

Oettinger: I have a vivid memory of being in his office, within a year or so after he had become DCI, and he was saying to me, "I have been had." What happened was that PERT was inapplicable in that situation, and besides, he didn't have the right staff. He was surrounded by hostiles, namely the professional intelligence people. The story of the Raborn incumbency is one of the stories of a dismal kind of a failure until he honorably withdrew, and I attribute that to the mythology of PERT.

Cunningham: It was a disaster. That's well said, but anything can be perverted, even PERT. I would argue that PERT, on its face, is a way to gain good service. If you want to distort it, use it for other purposes, certainly you can do that. Do they do it? Yes. Is there a program manager around who does not lie? No. Is that a sad situation? Yes, but it is a reality. It's part of the culture. It's a tragedy, but that's the way it is.

So, if this tool helps them lie better, with more apparent validity (and that's what we're talking about here), too bad, but used right, it's not necessarily so. I won't bore you with the details, but I happen to have a story where PERT was used as intended and did extremely well. There was no reason to try to make anything other than what the calculations showed, so it was fine. It was not used alone. That's another corollary. You don't want to do that.

But the point about cycle time is that you begin to use these techniques—hopefully not abuse them—with the computing power that's now available to us. Some would say that will only help you lie better, and perhaps so. I don't think so, because if we are going to work in the national defense, in this case, and we have precious few dollars, it's as Bernard Shaw said: "We're running out of money, therefore we must begin to think." So it helps us to think. These are all aids. The 140 billion brain cells between your ears certainly ought to be used to their best capacity, and there are ways to help that. These are the kinds of things that help. That's what Gansler is getting at. He knows he can be had every day. He *is* had every day. But if you try to understand the revolutions in business affairs and his hypothesis, you will then begin to understand where the revolution is coming in the military forces.

Student: Going back to the obstacles, and the argument that if you are buying fewer bombs then you must be doing it right, it seems correct to say that we should be on top of information warfare. We should try to exploit whatever we can with it. But if you look at the theaters of operation that the United States is involved in at the end of this century, the enemy is always significantly less developed. It's not somebody who is anywhere close to our level of technological exploitation. So, will buying fewer bombs indicate that it will make you better at fighting wars when usually it's a bunch of guys with assault rifles in the mountains?

Cunningham: That's an excellent point. That has to do with what we call an asymmet-

ric frame. (Naturally, we have a frame for everything, don't we?) Most of the threat that we face is asymmetric when compared to our forces. The context of my comment, though, was that in a financial ecosystem that is visibly finite (an ecosystem by definition is finite; this one is visible to us), like our five-year defense plan—how much money we have over the years—then you have to make tradeoffs within that ecosystem. That's what I'm suggesting. So it's just sort of an indicator, but when we see less invested in the kinetic solutions, maybe we could deduce from that that more is being done in something else if the total expenditure is the same.

Now, with regard to the something else, the idea of information operations applies to everybody to one degree or another. The idea of sophisticated information warfare would apply more to the more developed nations, but not just to them, because there's a hierarchy on which this thing is applied from the most basic to the most sophisticated. That aspect is probably less important in the poorer countries.

Just one other point here. There is a little reversal to be had here. I was recently at the Marine Corps laboratory at Quantico, Virginia, and the Marines showed us how they're using a little Kenwood radio to talk at squad level. They have a small body of troops who normally operate on verbal commands, and it's very easy to tell when a unit is moving. You hear them moving. Squad up, squad back, whatever they're doing, they're talking about it.

What they did was go to Radio Shack and buy these little Kenwood radios. They cost $80 apiece. They put them right in their breast pockets, extended the little mike, and they could talk very nicely to one another. You can hear within several hundred meters what a particular guy is doing. By the way, it even has enough capacity to transmit electro-optical imagery back, so the device could be augmented. There's always a way to add on to these things, isn't there?

This little $80 device is now spread out among this test squad. If they go into an operation against a sophisticated opposing unit that does not know they have these, the defending unit does not hear the squad coming, and all of a sudden they find themselves overtaken by this squad, simply because they could speak quietly. They don't have to communicate loudly. So, that's pretty simple, isn't it? That's good use of technology. It makes sense. It saves lives. It makes them more effective.

We were thinking about that and I said, "Okay, now, how long will it take you (here we go to cycle time), after you develop your doctrine, tactics, techniques, and procedures, to field that kind of device to the Marine Corps?" The answer to that was, "Well, about two years," because of the way program budget development works in the big government. I said, "What happens in the meanwhile?" Here's the reversal. When that asymmetric threat—Osama bin Laden or whoever it might be—hears about this, and he will, he will have his people buy the little radios, and he doesn't have to wait. What, in the meanwhile, is the defending force defending with? They're defending with the old doctrine: that they're listening. There are people using small unit tactics, using raw voice communication.

So that's how it can be reversed. Remember that terrorist threats, be they domestic or international, can move very fast. They're highly agile. Therefore, that's one of the things that changes as technology becomes available. They can put it to work very fast. So, in these more traditional organizations, we must be able to work fast as well.

Student: I don't know if this story is true. During the Dayton Accords, the Americans took Milosevic to the situation room that showed the Balkan scene.

Cunningham: Yes, Power Scene. Did you use this in class?

Oettinger: No.

Cunningham: The story is this: they were negotiating at Dayton, and they were arguing over the boundaries, the buffer zones, the demarcations, and all this business. They were using data that was all electronically developed. One night at about 10 o'clock Milosevic went down from the club room to where this device was, and the fellow who works on that was there. Milosevic said, "Show me this road," and the operator said, "Where is that road, sir?" Milosevic showed

him where it was, and the operator flew his little joystick device around to that road. Milosevic said, "Okay, that's the road. Let's go down this road about three miles, and now turn right. Now I'm looking for a lake, a pond. Oh, there it is." The operator told me, as he's told many other people, "It was then that Milosevic said, 'That's where my grandfather taught me to fish.'"

So, what does this lead to? Now, when the technical advisors say, "That line is right here," Milosevic believes it. Remember, they were really splitting hairs there. They sometimes put that line down the main street of a town. It made him a believer. He went from being very skeptical to being a much more willing negotiator as a result of that. That's the way it was reported to me.

Student: Yes. I've heard that they also used that argument for strength of bombing in Serbia. American pilots are trained to know the vineyards and so on.

Cunningham: I have not been in a meeting to work on that since 10 o'clock this morning. This is where we were looking at how we could use digitally developed, recorded, and conveyed imagery, implanted into a moving system to overlay a course that you want to overlay, and do it better, on a smaller PC, with higher definition. Almost every day I'm in a meeting like that, because we can do so much with IT.

What I looked at this morning was a system that we call Eagle Vision. The pilot can literally take it home on a disk, and he can fly his mission right there on his PC, on his laptop. Interesting! What does that also say? Couldn't you also put the threats in that database? Couldn't you overlay that? Yes. Couldn't you also put in certain other notations of interest, such as areas absolutely to avoid? Yes. Et cetera.

In fact, there was a Defense Science Board (DSB), now almost three years ago (Tony, you may have been involved in this), where Jim McCarthy and Robert Rosenkranz[3] and those guys got together, and what they looked at was how we should configure all this digital information. They came with a construct that said: Everything emanates from the center of the Earth, so let's satisfy that. Let's relate everything from the center of the Earth out to infinity, and let's overlay this. We'll overlay all kinds of information, including commander's intent, where the friendly forces are, where the enemy or opposing force is, and so on. This could just as easily be in the civilian realm: Where people are in danger from a flood when the water's rising (think Manitoba), or where the ice is. All those kinds of things can be overlaid digitally. It's what we have come to think of as the Global Geospatial Information System. It's all information based and becoming central to the operational art.

Oettinger: I seem condemned to be playing the role of the naysayer, or the skeptic, or the devil's advocate, but to borrow an analogy from business to the contrary, any businessperson who's ever relied on an inventory control system without walking out on the floor and counting has sooner or later gone bankrupt for all the obvious reasons. There is this enormous problem of having an enormous database and the question of how much of it you can rely on. For those of you who know Professor Lewis Branscomb here, he at one time was director of the National Bureau of Standards, now the National Institute of Science and Technology. In those days he lamented that even the physical constants, like the gravitational constant and other things, out past certain decimal places are objects of controversy and inaccuracy, which is of great concern, for example, to the people who build bridges and so on. So I put that to you. How does one live with that?

Cunningham: The only response I can make is that it is the other side of the argument, as was presented to us as recently as last week by General [Montgomery C.] Meigs, the commander of USAREUR. He made exactly this point: "Look, we're working in Bosnia to achieve peace, to get people resettled, et cetera, and the database that I'm using for

[3] Major General James E. McCarthy, the civil engineer, Air Force Logistics and Engineering; Major General Robert Rosenkranz, commander, Army Operational Test and Evaluation Command.

this resides back at the Joint Analysis Center in Molesworth, England. But the action, where people know, where my soldiers are in the street with people, where we have other activities going on whereby we can learn things, all ought to be put into a database forward, because the database gets better context, gets more depth, gets better interpretation, and becomes more responsive to the needs of those who will use it if it's forward than if it's back there with the people who are in their bunkers.

Oettinger: If I may have you continue to play a game that I'm trying to engage the class in, which is of thinking in terms of balances and trade-offs and so on: absolutely, you move it forward. Now, one of the reasons for not moving it forward is that it becomes vulnerable to being blown up and captured, which is a strong argument for having it in Molesworth. So, therefore, the question, which sounds kind of simple and clear cut when you start, becomes one of these myriad matters whereby the RMA is something which decision by decision is a very difficult thing to think through and guide and deal with.

Cunningham: Why was the analysis center put in Molesworth in the first place? Because the threat was too close to where it was previously located in Stuttgart, Germany. It was a different context, the Cold War context. But what he says is right. Now, what else was in that? There's always something else. Yogi Berra says, "It isn't over till it's over." We all know it's never over. That's the point here. What else was in it was that if you take the database and the analysis back there, then I don't need to keep the footprint, the presence, the support of, the protection of, et cetera, that kind of supporting activity forward. I was there when the argument was made to move to Molesworth, and that was part of the argument. It was security and lessening the overhead for it. Every one of these things does have this constant pull and haul, this friction, in it. We should never think that we've just automatically jumped to the "PERT solution." This is an example of where PERT might become the problem. This is the essence of critical thinking. Let's understand all the arguments before we start pitching them out categorically.

Oettinger: If I might accentuate the positive, the argument for agility, in many respects, rests on that. If it ain't ever over, then the constant agility, the constant ability to adapt, to think through, and to think of the trade-offs and the balances not as something that you put on the shelf and cast in concrete, but as something that you've got to be thinking of all the time, becomes, perhaps, in a nutshell, the single most critical factor. Agility. Absolutely.

Cunningham: It's troublesome to me. I believe it's just a cyclical thing in human nature that does this; but the better things seem to get (define "better": mechanization, technology, et cetera; it does more for us, it's attractive to mankind and, therefore, we'll have more time, more leisure, et cetera), the harder we have to think about them, if only to be able to exploit what is before us. We all know why humankind is here: it's because of the ability to adapt that Tony talked about. We're the best, and we have to keep after it. So, we do have to think about it, because hidden in everything is that whole body of unintended consequences that people like to talk about these days.

Student: As we get more and more advanced or are able to leverage more bandwidth with better digital compression, why is there still the argument about why you are keeping it in Molesworth? Why not bring it back to the States or something like that?

Cunningham: The argument has been made. Thank you very much. That would only take the database further from General Meigs, and the trust would be further away. It's not a phenomenon; it's a condition that is felt in the U.S. defense establishment, and my friends in the U.K. tell me it's the same kind of thing there. In our forces, in the United States, field commanders (I have been one of them) tend to think that the more that activities, capabilities, whatever they might be, are identified with something inside the Beltway (read: where I work—the Pentagon, or something like that), the less utility it will have for "us."

So, be careful about these guys coming from the Pentagon telling us about how good things are going to be. This is the argument for field commanders wanting what we, in military terms, call organic capabilities: capabilities that we, the field commanders, have control over. Otherwise, where are we? You can't give everybody their own everything, but we have to find balance in this. We have to find affordability. We have to be able to (what's the latest kind of buzzword?) manage risk. We have to do all those things in order to compromise.

Oettinger: It gets worse, by the way, because what Chuck is talking about at the moment is within the military. If you look back on some of the earlier presentations in the seminar by some of the budget and national people,[4] you'll see that the U.S. intelligence budgets are organized among several categories, but two of the main ones are the National Foreign Intelligence Program (NFIP) and TIARA, Tactical Intelligence and Related Activities. TIARA is these close-in things for the guys in the field, in the military. The NFIP is things that are supporting the secretary of state and the President of the United States, et cetera. That's in principle. Now in practice, there are some days when the President doesn't need it and it's in the service of a pilot in an airplane over Bosnia or in Iraq. Conversely, it may well be that something that is of importance to the secretary of state or the President of the United States comes out of some field radio that some guy is walking down the road in Bosnia.

So this neat division doesn't hold up very long, and as you would expect, when I need it, when the fate of the country is at stake, why, it belongs to the Commander in Chief. When my own ass is in it, I want it myself! So now you say, well then, we ought to buy one for everybody. Ah, but they cost money, and some of them are not divisible, et cetera. Then we're back at the point that Chuck made: that this is a continuous, unsolvable, ongoing argument. Absent infinite money and infinite resources, and given that some things are large and some things are small, and some things fall naturally under higher-level control because they're so expensive and some things you can give away and everybody has one, there is no end to that argument. Even if you were suddenly to be generous and give one to everybody (and this is an area our national security fellow is thinking about)—supposing that you have cheap mobile this or that so that we're in constant touch with the whole damn globe, and now you can give one to every private, every sergeant—should you give them the authority then to call in tactical air support? Should you give them the authority to have Baghdad nuked? They're right there out in the field. So, now where is the control and the command when those information and intelligence assets are distributed all over the place? No matter which way you cut it, these issues of trade-offs and agility come up. This is where, I think, your point is so well taken that the more resources you have, the more these arguments become important.

Cunningham: We're talking about where I live.

Student: As more resources become available, the security to complement them can be even more of a problem because you would have more resources available and more people those resources have to reach. This is especially true if it's in a situation where those people should be limited, but the means of communication are universally available.

Cunningham: Yes. You're right. You don't just give everybody everything because technologically you can—because it's doable, do it, if it's affordable—and you don't just keep things away from people because it's not affordable. This is why we have things called doctrine, tactics, techniques, and procedures. Certain people are supposed to do certain things at certain times. That's all covered in doctrine. By the way, that is a principle that

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[4] Arthur V. Grant, "Effective Intelligence and Free Democracy—Is That an Oxymoron?," in seminar proceedings, 1995; Keith R. Hall, "Intelligence Needs in the Post Cold War Environment" and Thomas P. Quinn, "Acquiring C^3 Systems for the Department of Defense: Process and Problems," in seminar proceedings, 1994; Walter Jajko, "Defense Intelligence: Adaptability, Character, and Capability," in seminar proceedings, 1993.

is not lost on U.S. industry. It isn't just the military practice. If you fly on an airliner, that airliner is run on doctrine, tactics, techniques, and procedures.

So the judgment that is required now to make all this work (and that's why I'm so glad you brought this up, because I had a note on that here) involves bureaucracy and policy. I haven't mentioned those yet. Bureaucracy is meant to be sort of a pejorative term because it has to do with turf wars about the General Defense Intelligence Program, about TIARA, about the NFIP, about the national cryptological program, and who owns what. I live in that world. If you knew the time now that I spend literally negotiating among agencies as to who has what, in order to try to integrate this information for my boss, Art Money! He has goals that say, "We have to solve Y2K." He's the chief information officer of the Department of Defense. "We have to protect our infrastructure. We have to take care of getting the best knowledge-based organizations that we can in the department. We have to exploit all of the strong points of technology. We have to develop a plan for intelligence in the 21st century." I happen to be the action officer on that, and that's going to be interesting.

All of these things fall to bureaucracy. All of these things require policy. What we do in the OSD, what the service secretariats all struggle with, is make the policy decisions that implement laws, including the budget that's in law. We must do it in a reasonably well thought out way, and provide guidance so that those who are required under law to organize, train, and equip do so in conformance with that guidance. Remember, the Army doesn't just run off and spend that money the way it kind of feels like it. No way! In fact, now there is a good Pentagon term—in fact it's a PERT term, you'll love it—"negative slack." There's negative slack in the discretion that the services, agencies, and commands have with the resources that are available to them. You just don't have control anymore.

Why? A four-letter word: pork. So much of the budget's got pork. So much of it is about the national economy. I served in Canada for three years. In Canada it is right in the law that the national defense budget will help Canadian industry. They're right up front about it: you'll do that.

Oettinger: If you look at the record of the seminar, for example, on NATO interoperability,[5] you'll find a tremendous amount on this matter of should the Dutch and the Germans and the United States, et cetera, be able to talk? Yes. Obviously, soldiers get killed in the front lines if the Soviets come through the Fulda Gap. For 40 years, precedence was given to national manufacturing in industry.

Cunningham: One thing you're talking about there is BICES (Battlefield Information Collection and Exploitation System), the communication system. All of that's in there, and the bureaucracy and the policy makers have a tremendous responsibility. In fact, I feel like I'm sitting here pulling six Gs just thinking about it, because it's hard. There aren't any easy answers, and the number of stakeholders is huge.

Student: If you have pork and you have all the huge bureaucracy that you have at the Pentagon, and if you have the CIA, what happens to your agility?

Cunningham: Less agility. You're exactly right.

Student: Along with the issue of agility you mentioned doctrine. It seems to me that the better organizations out there, the Nikes of the world, not only understand where they want to go, but they also have a vision. They're able to develop a doctrine quickly, because that's how they're going to serve all their customers. They need to have a doctrine established. How do we do in the Defense Department, in matching doctrine quickly to technology, for instance?

Cunningham: That's where you have to go down to the TRADOC, Training and Doctrine Command. That is what they do.

Student: Is it quick enough? Is it agile?

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[5] See, for example, Barry M. Horowitz, "The Emergence of Data Systems: Cost and Technical Change in Military Systems," in seminar proceedings, 1993.

Cunningham: No, it's not.

Student: The Army has TRADOC, and there's the Joint Warfighting Center for joint forces and so forth.

Cunningham: Sure. You can have all these mechanisms, but there's something deeper than mechanisms, and I think Tony would agree with this. It's culture.

Oettinger: Fortunately, within the military there is also a thing that I call creative insubordination. The class (at least the military people) nearly ran me out of the room until Admiral Tuttle came by and said that that's absolutely right, because if it worked by the book, it wouldn't work.[6]

May I point out another failure of the formal analogy with business? I don't give a damn whether Nike survives or not. I'm buying shoes. The stockholders of Nike care. The venture capitalists, who supply 95 percent of all the new ventures that go down the drain, care. But the economy of the United States and of the other capitalist nations moves ahead because when the mistakes are made they get buried quietly. Those who lose money say, "Hey, that's life." That happens to be tough on some widows and orphans, and then we say that to the Securities and Exchange Commission, but by and large, venture capitalists who know what they are doing are gambling.

Now, there is only one Army, there's only one Navy, et cetera, and, therefore, you can't quite have that same Darwinian thing. You don't in principle, but thank God, in practice you have some measure of creative insubordination, which even in large organizations creates some of the agility that we associate with small ones. If there were not insubordination, I think we'd all be dead.

Cunningham: I won't pay that much homage to insubordination, however ....

Oettinger: After all, I'm a civilian, he's a general.

Cunningham: I'm a civilian! I'm protected under the First Amendment. I'm okay. But there's a lot to that. Now I'll give you a classic example. This is another one I haven't dealt with since this morning. It has to do with commercial imagery—the use of commercial remote sensing for military purposes.

We're going through a very difficult cultural adjustment in certain agencies in our government, in our department, in bringing in commercial imagery. Why would that be so hard to do? You can get much broader area. It's going to be widely available. It serves the private sector. You have high leverage. You have competition you can bring to bear. You don't have to capitalize up front. There are all kinds of advantages to this. Why would we be fighting it, or not fighting it, just sort of resisting it?

Well, there are a lot people in these DOD activities who have always done it our own way, with our own stuff, and we don't like that. "What are you saying? Are you saying my job might be in jeopardy?" I will tell you, more than anything else, people fear for their jobs. Where does charity begin? At home. Now, the trick for the policy maker is to get all of this to where it doesn't threaten those who work. I don't fault them for fearing for their jobs. Those who do and who would resist that kind of endeavor, that kind of change, that kind of a migration, I don't fault them at all, but I do know that we have to work harder at the policy level to make everybody understand it. These jobs are not an issue. This is about doing the job better, in fact, for nothing more, probably less.

So, this is one that you see on the horizon. It is an IT issue. It is hot right now, and it's going to unfold over the next couple of years. Art Money, my boss, and I, and all the guys that work with him, right from Secretary Cohen on down, are pushing hard to get as much into the private sector as we can get. That's where it belongs. Anything that doesn't have to be done by somebody in uniform eventually is going to migrate to the private sector, and it should. That's not pork.

Oettinger: Trade-off. What happens when the military gets so hollow that there's nobody left inside the military to evaluate what to purchase?

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[6] Jerry O. Tuttle, "Tailoring C^3I Systems to Military Users," in seminar proceedings, 1988, and "The Copernican Pull," in seminar proceedings, 1993.

Cunningham: I think that's an extreme case, but possible. We have been there before. So, we develop our policy in a certain way, like creating the acquisition corps, as a hedge against letting that happen.

Student: One of the characteristics of information technology is that it has changed so fast that the moment you acquire it, it's outdated. What is the United States, or what is your office, thinking right now about adopting this technology into the U.S. Army, knowing full well that you have very limited resources?

Cunningham: Go as much commercial off the shelf as you can. Just because it's not invented here doesn't mean it won't work. So, adapt as much as we can that's readily available from the private sector. When we have to develop something, it should be done only because nobody else has done it already. We should urge the private sector to do it first. That goes right back to my discussion about remote sensing.

Student: I have three questions: I'm actually working on this very issue with the NRO at this point. First, you mentioned it's an issue of jobs; whose jobs? My second question is: What are the legislative problems with this? The third question is: If you do go commercial, what happens when these commercial companies start selling to foreign governments and how do you regulate that?

Cunningham: It is again an issue of jobs, but that's not the only issue in there. When I talk in terms of culture, it's all about jobs.

What about the legislation? The Congress is pushing us to do as much of this commercially as we can. They don't want us to be doing this in house. By the way, it's fine to talk to the National Reconnaissance Office, but you ought to be talking to the National Imagery and Mapping Agency.

With regard to commercial products and making them available elsewhere, whoever thought that we were the only game in town? Do you think we're the only people with one-meter imagery? The French don't have it? The Russians don't? Et cetera. In fact, you can turn that argument around. Why should we penalize American industry while others then can grab the marketplace? That's what I would expect.

Student: What if you can buy the same imagery cheaper from the French or Russians?

Cunningham: Buy it there. It's a free market. By the way, we're already doing that.

Student: But then the French or Russians will know what type of information you're interested in.

Cunningham: So you consider that. That's another consideration, obviously.

Oettinger: Among the trade-offs.

Cunningham: Yes. But, if you say, "If I were doing this, what arguments would I use? What would come to mind? What would my considerations be? What parameters would I put on this?" you would be close to right. Think about it this way: "If I were doing this from here, what would I do?" You will probably come up with the right answer.

Student: What about the U.S. government looking at a particular niche, for example, imagery? You could have rapid returns, rapid updates, rapid revisit rates. In other words, let the market do its thing, but maybe the U.S. government should focus on one aspect of imagery.

Cunningham: That's the strategy. Those areas of our needs that are not met by the private sector are the ones we should work on. We should try to get them to work on it; otherwise, we should do it.

I think we're about out of time, unless you would like to ask one last question.

Oettinger: No. Thank you very much. This has been marvelous. I really appreciate your coming out of your way, and I have a small token of our large appreciation.

Cunningham: Thank you very much. This is beautiful. In the military, what do we call these things?

Student: Mines.

Cunningham: Did somebody say mines? It's a traditional coin. It's very nice. Thank you very much.

Oettinger: Our pleasure. I thank you so much, Chuck.

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ISBN-1-879716-63-1