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**Putting C$^3$I Development in a Strategic and Operational Context**
**Ruth M. Davis**

**Guest Presentations, Spring 1988**
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# Putting $C^3I$ Development in a Strategic and Operational Context

**Ruth M. Davis**

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**Oettinger:** It's a pleasure and an honor to introduce an old friend, Dr. Ruth Davis. I don't know any other words than that. She has agreed to be interrupted with questions as she goes along, and with that, it's yours.

**Davis:** Let me make some background comments. With the class's indulgence, I'm going to take the liberty of putting today's world of $C^3I$ into a context provided by its 30-year history, during which I have had the fortune to stay involved. I would like to use two charts to depict some significant $C^3I$ trends. Figure 1 traces how information has been aggregated for decisionmaking in that world over the years, or, in some instances, disaggregated. Figure 2 shows the associated military operations and defense strategy trends that parallel the technology-oriented evolution of figure 1.

There is no question that technology has very significantly shaped the world of $C^3I$. There is no question that the world of $C^3I$ has in turn significantly influenced the conduct and the scope of military operations. Which is the influencing factor and which the one that is being influenced is not always apparent.

To give you an historical perspective, in the 1950s we saw the beginnings of operational control or military control systems. The first such systems, which were the predecessors of modern command and control systems, were for specific purposes. For example, the Air Force had the SAGE system — the Semi-Automatic Ground Environment system. It was headquartered at Hanscom AFB and had air defense as its dedicated function. It was a specialized system that matched the computer and information handling technologies available at the time.

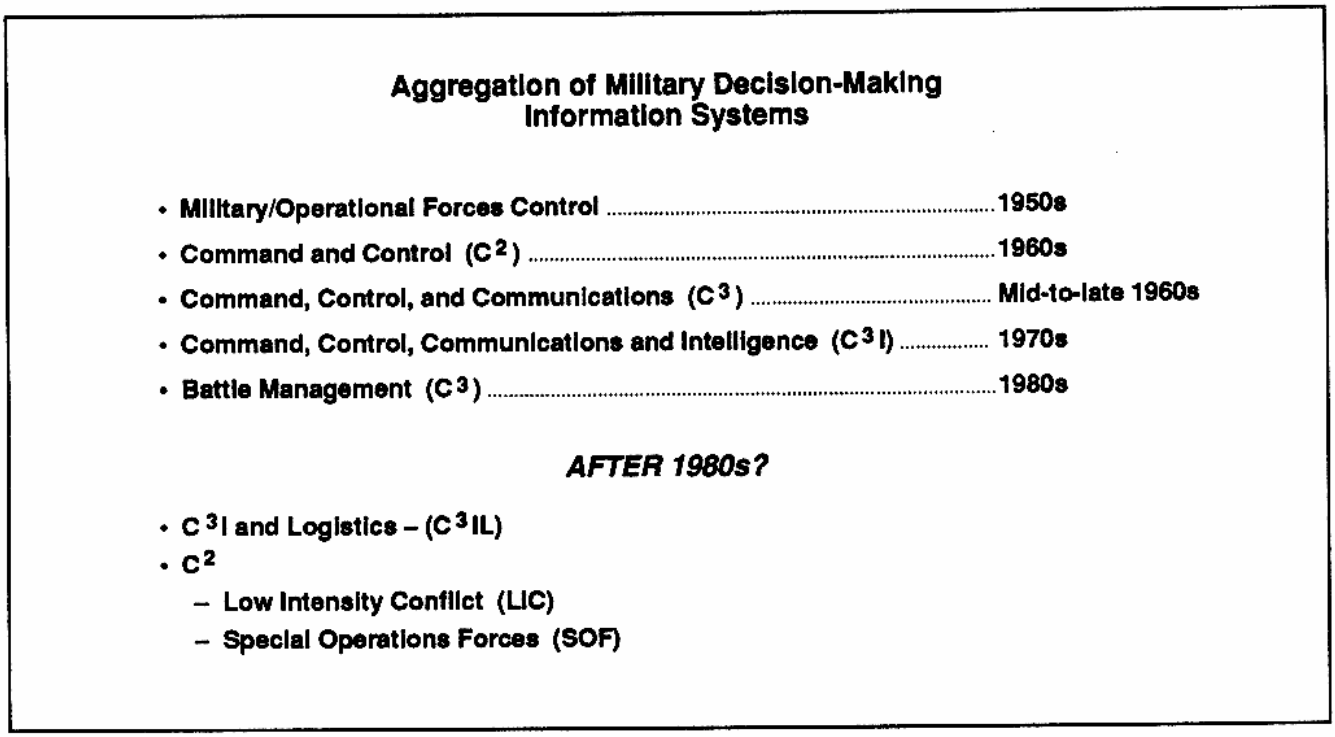


**Figure 1. C³I Trends**

The Navy had similarly dedicated systems, known as the Operation Control Center System and the Navy Tactical Data System (NTDS). The NTDS still exists on board ships, and almost in the same configuration as it did 25 years ago. The principal change is the speed at which information is handled.

In the 1950s, the functions that were done under what was called "C," meaning control, were those that matched the information handling technology of the time. In the 1960s, technology allowed a much greater aggregation of information in computers and a greater sophistication in the manner in which computers could handle and display information. This gave meaning to the phrase "command and control," or $C^2$, which was "invented" at a conference at which we were trying to describe decision making by military commanders. It did not seem to be a very significant decision at the time, but the phrase has been long lasting and has become a part of both military and technological terminology.

In terms of aggregation of information, $C^2$ implied the development of information systems, not just at single control or functional control points, but in a standard manner which made compatible the systems of theater commands, commands in the Pacific Fleet, commands in the Air Defense Command, the Army, and European theaters, under the rubric of $C^2$ systems.

In the mid to late 1960s, there was a recognition that military information handling in reality was distributed in nature. The decisions were made on a distributed basis in a theater, at the commander in chief level, and at the unified and specified levels. Decisions were being made at the Washington (National Command Authority — NCA) level, for which communications were essential. And, as we know, the phrase $C^3$ came into being: command, control, and communications.

**Oettinger:** Before we go on, I didn't catch what you said — what the conception was then of control.

**Davis:** The original concept of control systems would fit what we would call tactical today. They were geographically localized, dedicated, or had very discrete bounded functional requirements. Control meant actual control of forces; it did not imply control of sensors, intelligence, or assets that were not under your immediate control.

In the case of the Navy, for example, it meant control of carrier aircraft. It meant control of the air control facilities on board ships, along with control

of shipboard radar. In the case of SAGE, it meant control by the Air Force of the air defense systems that were along the East Coast and Canadian perimeters.

**McLaughlin:** Differentiating control from command.

**Davis:** I'm differentiating control from command. In the early days we were not able to be as precise as we are now. The differences between $C^2$ and C probably centered on the ownership, size, and processing of computer databases, along with the ability to make decisions requiring the aggregation of a large set of incongruous data or information. From a military point of view, $C^3$ implied automated decision-making capabilities at theater command levels, and at the unified or specified command levels.

The reason that automated decision-making aids migrated to higher levels of command was due to the appearance of more capable conventional computers, such as the IBM 704, the Sperry 1103, and the CDC-1604. They had large databases of varying media and rapid throughput. One could see then a concurrent aggregation of decision making and a distribution of automated $C^2$ systems. Information that dealt with force structure, or with the infrastructure of command, was digitized.

As the 1970s approached, the role of communications became extremely important: people became concerned about whether they could get information from naval forces in the Mediterranean through to the Commander in Chief of the Atlantic Fleet in Norfolk in time. Could information get back from Europe to SAC to assist in the nuclear strikes that were underway? Could information get back to the NCA in Washington so that the Joint Chiefs of Staff could see what was going on in the Pacific at the same time as they could be informed about what was going on simultaneously at SAC or in Europe? One began to see real-time strategic decision making on a global scale because of the ability to communicate and process $C^2$ information in near real time. These were primitive communications compared with the state of the art today, but they marked the beginning of space communications, the beginnings of satellite communications, the beginnings of dedicated land lines, and the beginnings of encrypted data links that covered the world.

As these communications systems came into being, so also did the phrase $C^3$. $C^3$ was identified with the first Worldwide Military Command and Control System, called WWMCCS. WWMCCS not only became an infrastructure for decision making at the operational level; it also became a programmatic and budget structure at the program and budget levels in Washington. It begat the mechanism to control the spread, standardization, and resources associated with command and control and communications ($C^3$) across the world.

We then had the beginning of functional $C^3$ organizations headquartered in Washington. $C^3$ became encumbered with bureaucratic control over what the military could do operationally: our warfighting capabilities became transmuted into budget and programmatic control as the driving force behind military capabilities.

**Oettinger:** When you say it was transmuted, are we talking within the defense world? Does this include Congress or is this just internal housekeeping within the Defense Department? Are we talking the services?

**Davis:** At the beginning of this $C^3$ era it was really the Defense Department. In the five years that followed, it migrated from DOD to the White House and Congress. This was because the same information became available simultaneously to Congress, to OMB (the Office of Management and Budget), and to the White House, whereas previously this real-time military information was only available where the relevant $C^2$ and $C^3$ systems existed. As a result, one began to have indirect control over operational and fighting capabilities through programmatic and budget control. It became commonplace for Congress to say, "You don't have the information to handle your fleet out in the Western Pacific. You need more equipment. Why aren't you in fighting for more equipment to handle your fleet? You don't even know where your submarines are in the Western Pacific."

In meetings concerning the European theater, Congress would ask, "Are you really communicating with your NATO allies? Shouldn't we be holding more of our information to ourselves? Are NATO allies in the same command and control centers?" ("Fusion centers" hadn't been invented yet as a phrase.) "Are we really operating as NATO?"

In the late 1960s there was a strong and successful attempt by defense policy makers to aggregate functions still further by creating $C^3I$ — command, control, communications, and intelligence. I fought that concept for about four years. My rationale was that having such an organizational aggregation would do nothing to improve the intelligence available to operational commanders either from their indigenous sensors or from central intelligence agencies. One would not, for example, be able to process both intelligence information and $C^3$ data in

the same computers or in the same rooms because of security problems. The principal result of a $C^3I$ function would be an aggregation of budget and management control in Washington that would dilute both the funds for $C^3$ and the funds for I.

Nevertheless in 1971 the $C^3I$ office in OSD was formed. In spite of valiant efforts over the years, my assessment is that "$C^3$" and "I" never really got married. They have just been forced to stand together at the altar for 18 years.

**McLaughlin:** The movement hasn't died. In conversation with General Stilwell yesterday, he said he was actively participating in initiatives at the moment that would break the I off again.

**Davis:** I was going to get to that.

**McLaughlin:** I guess the other thing is that he decided a long time ago that communications was implicit, or involved the level of, how can you have command without communications? How can you have control in the absence of communications? It's just a necessary means to that end.

**Davis:** That's right. Communications is truly a supporting function of $C^2$. Intelligence, on the other hand, exists both for operational commanders to use and as an entity in itself in that its use may change the entire type and indeed the need itself for military conflict. So I believe that intelligence is a bit different from communications. Communications is not an entity in its own right, in the sense that it has substance to it.

Over the years there has been a continual cyclical oscillation in views about breaking up "$C^3$" and "I" or putting them together. In operational commands they never took J-2 and J-3 and made a J-9 out of it, for example. There has never been a real combination of "$C^2$" and "I" functions at operational sites.

**Croke:** There was once, when Bill Creech was in Europe, only it was garbage in, garbage out. After he left, they tried it one more time, but it didn't last.

**Davis:** You're right, but he had separate staffs. In the 1980s we are witnessing a new dimension in $C^3I$. $C^3I$ has really come to connote decision making in an abstract and programmatic sense, in contrast to its start as an operational or a tactical function. Today, we see the phrase "battle management/$C^3$" popping up in both a tactical and a strategic sense. It exemplifies the Strategic Defense Initiative and the associated control of military operations in space. Battle management/$C^3$ is the phraseology describing control of and by the Strategic Defense System of space assets for strategic defense. Battle management/$C^3$ brings us full circle to where $C^3$ again implies primarily the management of forces and not just the management of programs and budgets.

Now let us consider trends of the early 1990s and what may happen after the 1980s. I anticipate with equal certainty one of two divergent trends. We may, on the one hand, aggregate functions even more. We may, for example, migrate to $C^3IL$ — where "L" stands for logistics. Currently, for the first time DOD has projects underway to digitize all the information in the entire logistic cycle in order to achieve massive improvements. In addition to making specialized changes such as remote diagnostics, DOD is telling commanders that they can have automated and computerized electronic logistics systems at their fingertips. So $C^3IL$ has definite attractions.

On the other hand, the divergent but equally possible trend is to disaggregate and return to $C^2$, C, I, and L. The force behind this trend is the disaggregation of military conflict as exemplified by special operations, localized tactical operations, and low intensity conflict (LIC), e.g., the LIC/SOF (special operations forces) arena which negates much of the military need for aggregated information data banks.

A SEAL (member of a Navy Sea-Air-Land unit) will tell you, for example, that he doesn't want to know all the intelligence assets that he can task. He has specific localized functional tasks, and carries out $C^2$ or C or I, depending upon what his mission is. But he normally doesn't worry about the $C^3IL$ or the strategic military or operational decision making. Prediction is difficult as to which trend will dominate, or whether both trends will occur as military conflict becomes more complex.

**Oettinger:** When you talk about the SEAL, my impression was you were talking about an operational concept of information on this, that, and the other thing, and a push-pull fragmentation. From a couple of other things that you said, one gets the sense that unification or fragmentation had very little to do with the operational, or functional, or systemic, or technical things that have to do with supervision, and budgeting, and management, and so on. Am I correct in saying that these motivations for aggregating or fragmenting might, at any given time, have come more or less from any of these sources, and that part of the complexity of the games going on here has to do with this multi-layered view, so that at any particular moment, it is not

quite clear whether one is talking about an operational problem, a management problem, or a budgeting problem?

**Davis:** That's right. As a lot more information becomes available in smaller electronic devices, and at faster speeds, political constraints or management decisions often dominate operational or military decisions. Management back at headquarters may decide that it's better to standardize, on a worldwide basis, on a particular command and control system, rather than to allow variations between military theaters based on variation in conflict types. I have witnessed many budget discussions in which the decision was made to give the same computer to SOUTHCOM in Panama that was chosen for CINCEUR or SAC, although missions and conflict environments were totally different. We have all seen programmatic considerations increasingly dominate operational considerations in $C^3$ decisions. $C^3I$ as an entity is a hybrid of programmatic, budgetary, operational, military, and political cross-currents.

**Croke:** What was the early motivation? Wasn't a lot driven by an obsession with strategic nuclear parity between us and the Soviets, and wasn't the rest tied in with budgetary issues? Now you see deviations. Now you see an emphasis on limited conflicts. Why we called things what we did seemed to be tied up with strategy. At one time all seemed to be bounded by us — our missile force, our bomber force — confronting the Russians. We kept adding things into that mission for that particular scenario.

**Davis:** You're right. You have actually predicted a vugraph I have put together. It is figure 2.

**McLaughlin:** I wanted to know two things before we left $C^3I$ and logistics. I think that historically it's sort of the reinvention of the wheel. For people like Wellington, or Patton, or Grant, the logistics were sort of a given. Grant was very specific in his orders to his commanders about where they were to have their ammunition deployed, because ammunition was his competitive edge against the Confederate forces. But I think also it's being driven by some of the stuff you see in the commercial world, with the emphasis on "just in time inventory" or the MRP (materials requirements planning) systems for manufacturing. All military systems are tied up in logistics and we've had the G-4 quartermaster there, too, for that reason.

**Davis:** If one analyzes military operations in a "logistics" sense, one should indeed go to the computer and order tank parts, based on the knowledge that the half-life of a tank in battle is still just a week. The real question, as yet unanswered, is whether it is best to put in long-term orders for three new turrets for a tank to make it last two days longer, or to institute "just in time" (JIT) delivery through the new unified transportation command, and get the parts just in time for the battle you're going to wage the next day. This is the kind of planning that should be done at the programmatic level. I do not believe it has been treated seriously either at operational levels or at military planning sessions.

As I've said, it is extremely difficult to judge which trend will most influence the future. All I can say is there is a tremendous interleaving of the information technologies and the type of conflict that could be undertaken at any given time in military history. One must be terribly careful when talking cause and effect.

The following sections of my presentation, on tactical and strategic military trends, treat the "trend ladder" depicted in figure 2. In the 1950s, the World War II heritage was still in place. We planned at the theater level. The results appear to be well handled, very well managed World War II vintage tactical military operations. In the 1960s, which is the period when $C^2$ appeared as a technological entry, and also when $C^2$ aggregated to become $C^3$, we saw the beginnings of the national military strategy of mutually assured destruction, of global nuclear targeting, and of military resources directed primarily to strategic targeting along with the supporting surveillance and post-attack assessment.

There was only one war envisioned in the 1960s and that was between Russia and the United States. There was only one dominant weapon, and that was the nuclear weapon. There were three associated dominant delivery mechanisms: the SAC bomber, the nuclear submarines, and the land-based ICBMs.

The management and development of this single-type conflict strategy naturally led to aggregated military decision making. We so successfully managed wars that they didn't occur. We managed rather than operated military functions. Command of forces occurred; control of forces wasn't needed.

From the mid-1960s to the mid-1970s, however, we witnessed a number of happenings as a result of this military strategy, *and* as a result of the advances in technology that allowed these strategies to be implemented. The CINCs came into more dominant positions, along with the NCA. The NCA epitomized a new era in military planning and $C^3$. There were command authorities in Washington that, because they had excellent intelligence and $C^2$

information, were going to do some commanding. The long-term results have been and will continue to be dramatic. I believe that the concept and effect of the NCA have caused tactical operations to be controlled primarily from Washington, with considerable diminution of the CINCs' roles. Global surveillance data became more readily available to the NCA than to theater commanders or CINCs.

**Oettinger:** In one sense I'm inclined to agree with what you said about the NCA not being possible before. But go back to the relationship between Truman and MacArthur, and the more or less documented or apocryphal stories of MacArthur tearing up the Teletype sheets he didn't want to receive. One gets a sense of a National Command Authority. You must mean it in a somewhat different way.

**Davis:** Thank you. I should be more precise. The difference is in the relative ease of obtaining near real-time or real-time intelligence and $C^2$ information in Washington. In addition, more information relative to the command and control of forces became available to the NCA than to any tactical, operational, unified command level. Technology was the reason. Communications, electronic, and computer technologies were the agents of change.

**Croke:** Isn't the Cuban missile crisis an example of your personal experience?

**Davis:** Yes. The next slide has some such examples. But certainly, the first instance drawn from my own personal experience was the Cuban missile crisis.

**Oettinger:** "Negotiated" in the slide is unclear to me.

**Davis:** The word "negotiated," as used on figure 2, implies that we're negotiating mutually assured destruction between ourselves and the Russians. Negotiated means that we had a treaty-driven military strategy. We negotiated a way of fighting a war or of not having to fight a war with Russia. It wasn't based on having superior forces. It was based on a belief of what we and Russia assumed were each other's technological capabilities, nuclear assets, and military assets. We negotiated ourselves out of a real war, and we negotiated an offensive strategy which precluded any defensive strategy until the 1980s and the surfacing of the Strategic Defense Initiative.

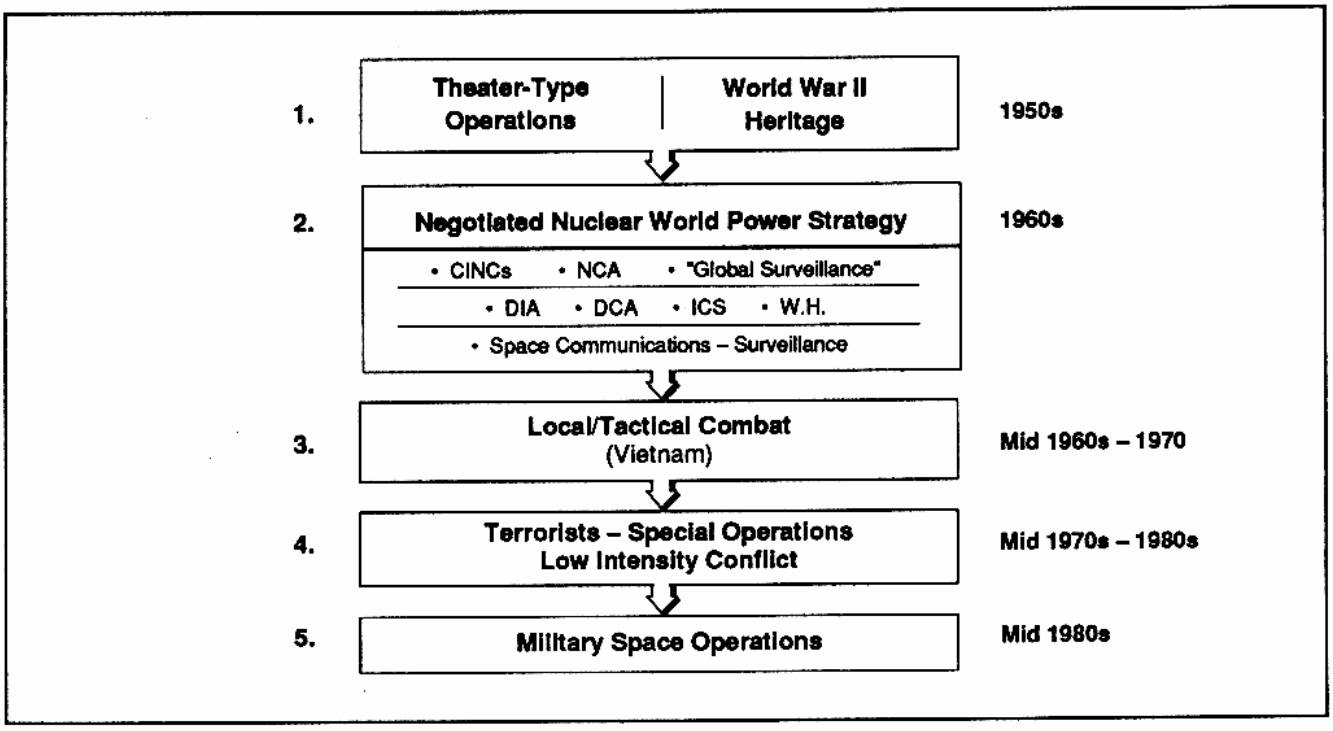


**Figure 2. Military Operations/Strategy Trends**

**Student:** How do you negotiate wars?

**Davis:** Perhaps if I said that "negotiating ourselves *out* of a war and simultaneously achieving our national objectives" was my definition of "negotiating a war," you might find that acceptable.

Let me now continue to draw observations from figure 2. In the 1970s, because we could process large amounts of information, and because we could put together complex system architectures, we increased our collection assets. Then, because we collected more intelligence, we needed more infrastructure in the intelligence community. This led, in 1961, to the establishment of DIA (the Defense Intelligence Agency), followed by DCA (the Defense Communications Agency), the intelligence community staff, and a powerful National Security Council supporting the White House staff and the President.

There was not universal agreement on the need for this increased infrastructure. The three of us who wrote the charters for the DIA component organizations were impressed by the lack of support for DIA by the services and operational commanders. Nevertheless, DIA still exists as a functional agency and as decreed by Congress. Its acceptance is still spotty.

Although there was also little support for DCA, DCA has absorbed some very important functions, such as WWMCCS management and support. The transfer from the Joint Staff to DCA of responsibility for WWMCCS was an indicator of significant changes in the offing: namely, the shift of management control of a function integral to operations ($C^3$) from the military to a functional support agency. You gave the system by which military commanders were supposed to control to DCA to manage.

Space communications and overhead intelligence collection satellites were managed by functional defense support agencies and further accentuated the trend towards increasing aggregation of functions and enhanced direct support of the NCA. Technology again was the primary driver for providing access to intelligence and operational data as fast, if not faster, to NCA staff as to military staffs throughout the world.

By the end of the 1970s it was apparent that the two-party superpower war we prepared for so well had been augmented — perhaps superseded — by localized or tactical conflicts. We remember Korea, and Vietnam, the advent of the terrorist "attack," special operations, and low intensity conflict. So with military information assets aggregated and ready for use primarily at a management level or senior policy level we were faced with the need to handle disaggregated information at local levels and tactical commands.

In the 1980s it became very apparent that we weren't able to "handle" needed intelligence adequately at operational sites in Europe, the Far East, the Pacific, etc. Neither were communications or security procedures adequate to get intelligence to those sites. Suddenly we did not have good command and control for the "popular" form of conflict. This led to a real budgetary surge for tactical-related operations and $C^3I$. New tactical and special operations $C^3$-like systems sprang up like toadstools. Standardization, interoperability, and compatibility were forgotten and replaced with demands for $C^3$ systems in the Persian Gulf or AEGIS (airborne electronic grid and information systems) in European tactical sites, in Central America, on tanks, and in mobile trailers.

The 1980s also witnessed increased space operations in support of military operations. At the same time there were widespread concern and realization that we did not have any realistic military capability in space or any real warfighting capability in space. Again, there was a great increase in demands for space-related $C^3I$ systems with corresponding budgetary pressure. Tactical $C^3I$ and space-related $C^3$ vaulted into first place for attention and for budget support. Disaggregated and highly aggregated $C^3I$ systems were equals in popularity.

**Oettinger:** The next to the last point about fragmentation — everybody wants to bypass the local commander and get information from Washington, etc. I couldn't quite tell on that one whether you were being matter-of-fact or sarcastic.

**Davis:** I'm being matter-of-fact.

**Student:** You made a comment a minute ago that some of the commanders were trying to bypass intermediate steps, to see where the tanks, for example, were. Is that bad per se, or is that good and now we're realizing that we have to be interoperable?

**Davis:** I would not give a judgment on that point. I was simply trying to say that there was a realization that information needed for local control of local forces was not available at the local control points. In trying to get the information that individual military commanders perceived as necessary for their local control, they were willing to bypass the line of command. And they will surely continue to do so.

**Oettinger:** Going back to some of the themes we've been hearing about balance, this is obviously

his own assets. One interesting aspect of this local development from control is the resultant importance of small satellites, or light sats as they are called. They do not require a "billion dollar sandbox" on each coast as we have at Cape Canaveral and at Vandenberg. You can launch them with Scout rockets at about $6 million a launch. You can control them yourself from local sites. You don't care whether they last 15 years. If they survive for a particular Persian Gulf affair, that is fine. If they last for a year that's even better. They are generally built to live three months. Some have had lifetimes of a year or more. They can be designed to be even cheaper. Their potential is exciting.

There is also a widely held consensus that we will not have a military capability in space until we can complement the extremely expensive space assets we now have for military $C^3I$ purposes with what I call these gap-filler satellites, the light satellites or small satellites. It is the satellite PC (personal computer). There is a lot of attention to the light satellite issue, because of the profundity of its consequences. Do you push for light sats at the expense of the kind of space satellite assets you have now? Do you push for them as complementary space assets? Whom do you allow to operate them? It will be important to follow this particular issue: one of the two or three most divisive issues that are currently besetting $C^3I$.

**Oettinger:** One of my vices is to look for generalizations that help simplify the world. The PC analogy, for instance, seems to be felicitous in another way, that again that's a tug of war. The centralizers, and the mainframe centralizers, and the PC anarchists, and so forth, are polar expressions of something which is a perennial tug of war. It seems to me that what you're describing is yet another arena where now technology has taken something where there was no alternative and made out of it a continuum along which folks will keep battling until they're tired.

**Davis:** Technology made it appear for the last 20 years that there was no alternative to going bigger and getting more complex in $C^3I$ systems; then suddenly technology makes available an alternative to complexity and bigness called personal computers. A proper balance between "few and big" and "many and small" in $C^3I$ systems will be long in coming.

**Student:** I was just wondering where you came down on light sats? You gave us a brief description there, but the argument is that although it's like Pampers or the Bic pen of space, you obviously get something of a lower quality for a lesser price.

**Davis:** That's the way it appears; for a lesser price you get lower quality.

**Student:** What do you see as a valid mission for light sats?

**Davis:** Light sats have been used for some time for special purposes. A light sats mission in escalating crises might be dedicated communications. A surveillance capability in a theater will give you a long needed indigeneous sensor. For operations above 65° north, light sats might provide excellent communications capability.

**Student:** There's SDS (the Satellite Data System). SDS keeps its sort of polar orbit.

**Davis:** Not for 24 hours a day for military forces. You now have communications shared by many users. You buy bandwidth, but not control. If I'm a submarine forces commander and I can have three light satellites that will give me total communications, I do not have to share them with anybody. They're all mine. It's local control and I've got it.

**Oettinger:** It's those last few remarks that make this axiomatic. It has nothing to do with satellites.

**Davis:** You are right. It's not the bandwidth. It's the control over a dedicated asset.

**Oettinger:** But no matter how many mainframes there are in any organization, they're always dedicated to whatever the hell it is you are doing, and there's always the guy who says, "I'm not in part of this project, and it's too much trouble. I want my PC." It's the same way. No matter how many supplied satellites we have, you've got something going in Libya, you've got something going in many of these places — they're going to say, "My assets are deployed over here and you can't have them."

**Davis:** If there is a scarcity of assets and you have more customers or conflicts than assets to use, the decision which customers or conflicts to serve is not yours. It will be made back in Washington. Also light satellites are easy to store and are launchable from a wide variety of sites with little preparation time. You only launch when you know you're going to need them. It's analogous to "just-in-time" satellite services.

**Oettinger:** It seems that what you've given us today is a fantastic pulling together of dynamics of these problems over a period of X years, and how it will continue. These struggles are not over. There's always a next one among the organizations, and today's young Turks will be tomorrow's entrenched

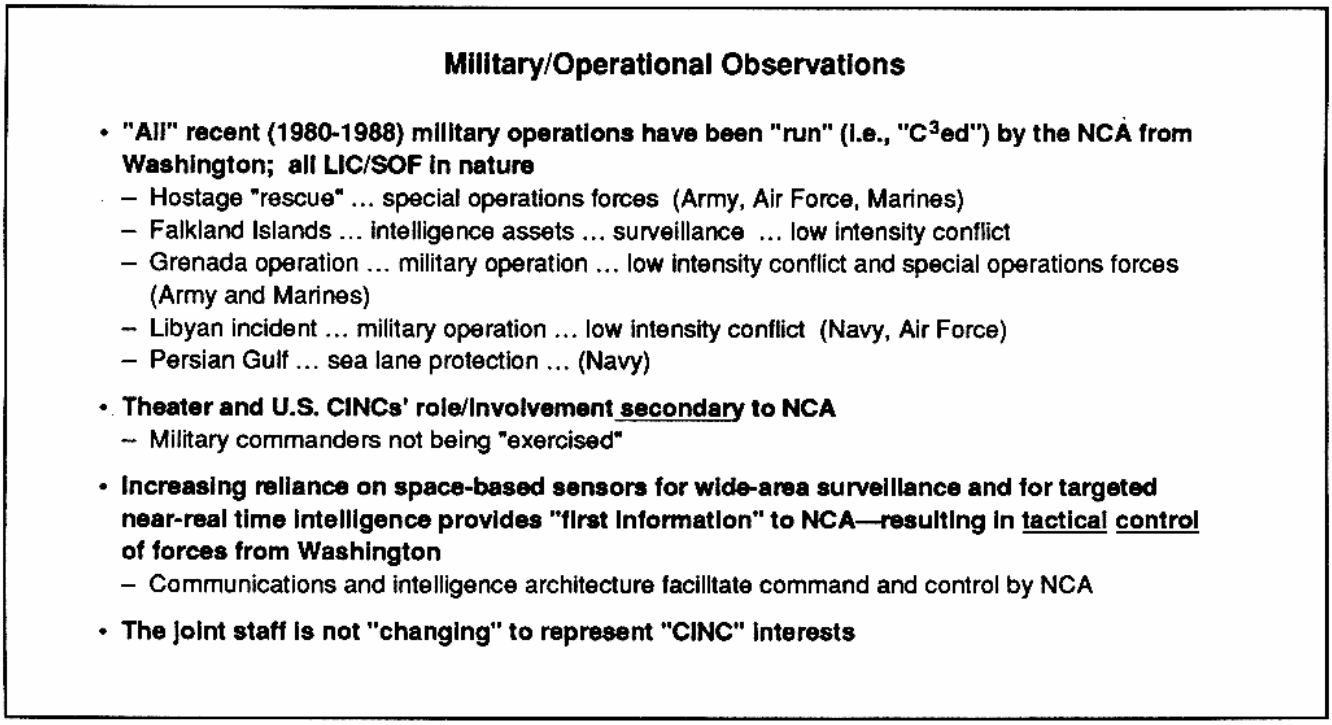


**Figure 3. Vignettes Circa 1988: C³I Perspectives**

Although Congress provides CINCSOC his own budget program (Program 11), it has been very hard to get the needed resources.

**Student:** Was there any reason you didn't include the Beirut Marine bombing?

**Davis:** These are examples; they are not a comprehensive listing.

**Student:** Then it's down to three out of six

**Oettinger:** Can we dwell for a moment on the relationship of the CINCs with the Joint Chiefs? The Vice Chairman was here earlier this semester and spoke in less than adulatory tones of the new Special Operations Command, especially describing that structure as another damn, or words to that effect, military department, and who needs another one. There's this question of whose necessity is whose unnecessary layer and so on. I wonder if from all these years of experience, is there anything you can generalize on all that? Is there something to be learned? Is it good, bad, indifferent?

**Davis:** There are indeed lessons to be learned. The Special Operations Command was legislated by Congress because DOD did not appear to want it. It was legislated as a package including a new CINC and a new Assistant Secretary for Low Intensity Conflict. As noted earlier, the new CINC, CINCSOC, was the first to have his own dedicated program budget. Since CINCSOC and the newly created Assistant Secretary were not popular in the Joint Staff and within much of OSD, there has been little volunteered support.

It really is too bad. Although attitudes change with time, valuable time can be lost in coming to grips with a type of conflict which has not received adequate priority or attention by Defense authorities.

**Oettinger:** That's my aphorism, "Where there's death, there's hope."

**Davis:** When you have a lack of cohesiveness in an infrastructure, say in C³I, or in non-nuclear strategy, there will be a void that will be filled by someone who has the same access to information as does the in-place infrastructure. Congress is filling such a void now: it is by default managing or influencing significantly the command of military conflicts.

**Croke:** Aside from Tony's very Irish comment about death and hope, what are the chances for the survival of the new command, considering the nature of special operations?

The Computer Security Act of 1987 again assigns greater responsibility to NBS.

**Student:** Well, I was going in a different direction. What are the standards going to be? In other words, basically, you did answer it in one respect, but who will develop the standards, and what will they cover?

**Davis:** Security standards are going to have wide coverage. The NSA National Computer Security Center is setting standards for trusted computer bases, database management, network security, and security audits — the whole range. The National Bureau of Standards is setting standards for these same areas. They are beginning to work together. If they can work together there will probably be some 20 to 30 standards issued over the next two or three years.

**Oettinger:** There is a problem which all of this leads to, which is that on the civilian side, which is less than on the military side, even if these standards exist, that's all well and good, but they tend to raise the cost of the equipment. Even when this internecine warfare has various periods of good will and detente, so to speak, the intended clients aren't found. One of the links that is missing is the incentive. The expressions are things like the Underwriters Laboratory. People won't buy fireproof safes unless it turns out that you can't get an insurance policy because you're keeping your valuables in something that's flammable, and you get a discount on your insurance policy if your safe is of a flameproof material.

**Davis:** It's what we call a standards-driven market. The banking community bought DES because the Federal Reserve Board required a standard. But the market for data encryption standards is in Europe; it's not yet here.

**Oettinger:** Again, another balance. You've got all that security, but what are the incentives, and who's willing to pay for what?

**Croke:** You run into that in spades in dealing with network protocols. It's a security problem how you wire the net up. The DOD and NSA decide they need certain security. The commercial people say they won't pay for that. The internationals say they'll do their own. You have a debate on what it's going to cost me for my installation. It's overhead on top of your other costs.

**Davis:** That's why we don't have security standards. The answer is in the marketplace, whether you're military or civilian; and it's a tradeoff. I've been assisting with security policy for the intelligence community for a number of years. We have security policies, but we don't have adequate security practices.

**Oettinger:** There's an extreme example, and that's the Australian Railroad System. It never got integrated. It never got standardized. The overwhelming need wasn't there. Railroads ran east-west to the coast, and the demand for north-south integration was there, but never as strong. By the time a push was made to integrate it, it became irrelevant because air transport took over from railroad travel.

**Davis:** To date companies and industry find it easier to pay the liability costs resulting from a security compromise than to pay for having a secure system.

**McLaughlin:** As in a lot of these things, the person being charged on the bill the first time around is not necessarily the one to pay the price. So if the 7th Fleet and the 7th Air Force don't have a secure conferencing bridge, the Marine Corps pays the price on Koh Tang Island.

**Oettinger:** Because of time, we have to abbreviate here. Ruth, thank you very, very much.

## Policy-Level "Conventional Wisdom"

- **$C^3$ capabilities have more effect on the outcome of battles than do weapons capabilities**
- **U.S. $C^3$ is a principal target of USSR**
- **Survivable $C^3$ is of highest priority to national security**
  - SDIO defensive policy: protect $C^3$ for first-phase deployment of SDS
- **U.S. commanders (CINCs) should be more "involved"**
  - Goldwater-Nichols Defense Reorganization Act (1986)
  - DOD Acquisition Improvement Act – 1986 (Packard Commission)
- **USSR has better COMSEC – post hostilities: WARM**
- **Technology edge still belongs to U.S.**
  - "Time to deployment" edge of USSR offsets U.S. technology lead

**Figure 4. Vignettes Circa 1988: $C^3I$ Perspectives**

## $C^3I$ Concerns

**Security constraints on intelligence collection limit the use of many intelligence assets in tactical/field operations**

- More intelligence is available to NCA and CINC headquarters
- Communications architectures and links favor fusion centers at fewer and more senior command sites
  - Communications is inadequately funded for tactical sites
  - Security is inadequately funded in tactical systems

**A few major security compromises have extensively harmed our $C^3I$ assets and operations**

**Operational capability for targeting the U.S. long-range weapons resides in CONUS "functional" agencies**

**The Goldwater-Nichols DOD Reorganization Act will cause severe stresses in resource allocation**

- CINCs to set requirements and no change in congressional modus operandi means many more "DOD officials" trying to slice the same dollar budgets
  - CINCs and functional organizations and services
  - CINCs do not have necessary support staff and data
  - Congress will wield relatively more clout

**Figure 5. Vignettes Circa 1988: $C^3I$ Perspectives**

a very fundamental point. The minute you can bypass some information, etc., etc., there is a possibility for bypass on another thing, which is the flow of command. The two don't necessarily go together. But clearly — this is hypothetical — it is impossible to bypass the chain of command if the chain of information flow and the chain of command are identical. There is less of a problem because the minute the flow of information and flow of command can be separated, the hypothetical becomes the real tug of war, and, in a sense, the history of these people has been one of back and forth on something which in the old days was only more of a hypothetical suddenly becoming real. Is that true?

**Davis:** You're absolutely right.

**Oettinger:** And there are no answers to that. If you go back now through your notes, you'll see a variety of views depending on where folks stood or stand as to whether those things are good, bad, or indifferent. That was a daily problem, whereas before some of this technology would be less of a problem. It's great to play games and rewire things and there are possibilities of autonomous behavior, or highly controlled behavior. The decision maker has no choice and what once was a matter of feasibility becomes a political problem.

**Davis:** When I try to assess what is happening in $C^3I$ in today's world — from a 1988 perspective — the question that stays at the forefront is, "Who is really the 'on-the-scene' operational commander?" Here, I refer to the vignettes I put together in figure 3. "On the scene" now can also be akin to "remote viewing" because of the visual and/or battlefield surveillance available via satellite communications and video displays. Now, when one answers the question, "Who is the 'on-the-scene-commander?'" one knows where the $C^3I$ assets are.

To put a further perspective on $C^3I$ today and in the future I have assembled additional vignettes in figures 4 and 5. But it seems that all of the $C^3$ military operations in the last eight years have been run by the NCA from Washington, and it seems they've all been low intensity conflict or special operations forces in nature. So if you will indulge me with my use of the "all" in both cases, I have qualified and said it's too pejorative but I'd like to use it.

A singularly important observation is that most tactical and special operations have been controlled from Washington — whether it has been the White House, the National Security Council, the JCS, or other. Examples include the hostage rescue, run out of Washington or managed out of Washington. We also saw the Falkland Islands operations where the U.S. national intelligence assets supported the British and were managed out of Washington. Grenada was managed by Washington, or by the NCA, as was the Libyan incident. In this latter case, a number of national leaders were involved in policy-making which directly affected tactical operations. The Persian Gulf activities are a current example of an NCA-run tactical operation.

None of these have been superpower nuclear incidents. None of them have had the two superpowers directly engaging each other. At best the interaction has been via indirection or by surrogates.

Perhaps because of increasing NCA activity in conflict situations, there has been a much closer internetting of the NCA and staffs in Washington in order to handle quick reaction requirements better than among the command authorities at other, lower levels. There have been discussions lately that the CINCs ought to be included in this very close internetting of Washington command authorities — NCAs — in the case of terrorist incidents. CINCs are only incidentally involved in such networking.

There are instances of such internetting of CINCs for specific high priority objectives. In one such recent instance, a three-year technology-dominant effort involving computer and packet networks actually allowed real-time exchange of necessary information automatically between CINCLANT, CINCPAC, and CINCSAC that for years had only been available on the Washington scene.

Another observation is that the CINCs and their theater commanders are not being adequately exercised in the $C^3$ environment. They are becoming less able to work together in a quick reaction modus operandi. They do not have the same information about the same geographical area, and they use entirely different decision-making processes. The result is poor military performance and a reluctance to rely on the CINCs.

Another observation given in figure 3 has a direct relationship to the emphasis of this seminar on LIC/SOF. It highlights the lack of indigenous intelligence sources or surveillance sources. Instead, LIC/SOF actions primarily use national assets. Near real-time intelligence or real-time intelligence frequently is accessible first by Washington and the National Command Authorities, which leads to the perception that tactical control of forces is better done from Washington. It may indeed be easier to communicate with a hostage rescue force in any part of the world from Washington than it is to communicate with the force from the theater commands.

somebody or others who will be sticking up for the status quo.

**Davis:** It is rather like a discounted cash flow analysis. You have to look at the status quo and discount back to the present to see what you're going to get 10 years later.

**Oettinger:** It seems obvious and simple when so many people don't understand, for example, that a headline of a technological breakthrough and effective field use, whatever the definition of field is — military, civilian, or whatever — has built into it that 20-year time lag that says that's what it takes for a generation of whatever to move on. It's not a statement about good, bad, or indifferent. It's a fact of life. When I listen to remarks about the fragmentation of the Goldwater-Nichols Act creating more entities, that says to me that you now have a shift of responsibility toward the Congress, along with the power and this brokerage that she described. The next major screwup that is attributable to congressional meddling, and micromanagement, and so on, will create the kind of dynamic that will move it back toward the greater centralization in the Executive. It's in those ways that you can see something of the various pendulum swings.

**Davis:** I cannot predict what will happen. I do believe, however, in your cyclical theory.

**Oettinger:** I just find it delightful. In terms of what you carry away with you in any roles you play, military or civilian, it's the personal observation of where the pendulums that affect you are positioned and where they're moving, so that in terms of your own person you have a better dectector whether you're moving with or against the stream, or likely to writhe in it and get caught and then act accordingly, depending on what you want to do. In order to do that you've got to be able to see them. What I find delightful about your presentation is that it's made a number of them much more explicitly visible than any of our previous visitors have.

**Student:** I know you talked about interoperability of computer systems between different agencies and so forth, and I know supposedly somebody's taking care of all that. But is somebody really looking at the computer systems and the software that we're buying, or are we just kind of glancing over that? It seems to me that for the strategic nuclear forces the interoperability is there, but for conventional forces, it's not there yet.

**Davis:** There are numerous efforts aimed at improved interoperability for tactical, local, strategic, and/or centralized systems. Interoperability requirements have justified the standardized programming language called Ada. Whether in Space Command, or in the field with a PC in a tent, Ada is mandated (with exceptions of course). There are over 150 standards aimed at increased interoperability. The military market is tracking the civilian or the consumer market in open systems with required interface protocols and standards.

**Oettinger:** Implicit, I think, in your question is the notion that interoperability is a good thing. It's not, necessarily.

**Student:** I have observed, though, that software systems do not exist when you try to data link information, particularly from a cruiser to a destroyer.

**Davis:** There are standards for data communications between commands and CINCs. For example, there are TADIL (Tactical Digital Information Link) A and B standards. The infrastructure for interoperability is in place. I think interoperability in "the small" is good for the kind of situation you described.

**Student:** Can I ask a variation of that question in regard to the technology encryption side of the software and of data. I read recently that there's been a lot of effort on the civilian side, and I guess Congress has picked up part of the ball, on setting standards for encryption for safeguarding data, and NSA has the rest. Can you comment about that in regard to how that's going to go? The technology side of that is really interesting in a couple of ways: how we're going to go about safeguarding data over the long term that's available on the public side as well as the government side.

**Davis:** It's cyclical. In 1970 I headed the Institute for Computer Sciences and Technology at the National Bureau of Standards (NBS), and decided that the civilian (nonmilitary) world needed encryption standards. I worked very closely with NSA for about four years to achieve what became the first civilian Data Encryption Standard, which you may know as DES. That was the hallmark of cooperation between NSA and the civilian side of government. The NBS kept its focus on the non-national security world under the Brooks Act, and NSA had the national security world.

Since about 1975 that relationship has eroded. The Assistant Secretary of Defense for $C^3I$ believed DOD could best set all such standards for government and for industry. Congress did not agree. The result has been a very confrontational environment.

**Davis:** First of all, it will probably continue to be rejected until the existing infrastructure is repopulated by new people with different views on conflict.

**Croke:** Do you think it's emotional, like General Herres's comments about the zealot snake eaters forcing it to happen?

**Davis:** It's emotional. It's equivalent to the Navy never wanting to believe in nuclear subs and only later reluctantly realizing that the primary reason it was a strategic force was because of its SSBNs (nuclear powered fleet ballistic missile submarines). This capability made the Navy part of the strategic nuclear triad.

Meanwhile, as all of this change occurs in the $C^3I$ infrastructure, and as new forces come into play, the disparity increases between the way we've developed our automated information decision-making capabilities and the kind of conflicts in which we engage (figure 4). Only recently has the widely held belief that $C^3$ capabilities have more effect on the outcome of battles than do weapons capabilities become accepted. This kind of thinking really didn't occur until the late 1970s. Before that, $C^3$ systems, computers, programmers, and automated systems were tolerated, but not accepted. It required the personal computer, and the education of a new generation of military, along with a new generation of strategists, to change traditional views. You will find in almost every current doctrine that $C^3$ has more effect on the outcome of battles than do weapons.

We have also been told that our $C^3$ is a primary target of the Russians. Another recent related change is in our targeting priorities. Back in the late 1960s and mid-1970s we began to target Russian $C^3$, as opposed to nuclear weapons and launch sites. This recent targeting priority gives additional proof that we believe $C^3$ capabilities have a significant effect on the outcome of battles. Survivable $C^3$ is the high priority of national security. We have a number of very important efforts underway to make sure that our $C^3$ systems at the NCA level survive in an escalating crisis.

Another observation in figure 4 highlights the intent of the Goldwater-Nichols Act to get the CINCs more into "the act," to get them more involved, and to make Washington pay more attention to them. Unfortunately, since the Goldwater-Nichols Act was not sought by Defense authorities, it is not being implemented in spirit — only in name.

I want to go through the last chart (figure 5) very rapidly. We're very much concerned today in $C^3I$ that the security constraints on intelligence limit its use in tactical or field operations. Fortunately, there are many studies going on to see how national assets can be made more available at the tactical level. I don't know whether this will be possible. One of the actions always suggested is the declassification of the intelligence collections over a certain age or those which have been made obsolete by technology. One can get excellent overhead photography in the open market that is very useful to our military forces. It shows Yankee ingenuity, I guess. If you can't get your own grocery store to sell you something, you can go buy it at the grocery store across the railroad tracks — in this case, we can buy it from the Russians.

**Oettinger:** In the wilderness spirit, one would argue that's capitalism for the Russians.

**Davis:** Absolutely. Security, however, must remain a real concern. We have had a few major security compromises that have really harmed our $C^3I$ assets and our $C^3I$ operations. They have been well covered in the press. The Walker-Whitworth case has probably been most damaging. It really must hurt our $C^3I$, and recovery will be expensive.

**Student:** What exactly do you refer to that we must recover from?

**Davis:** From the damage that was done to our $C^3I$ infrastructure.

Continuing with the topics of figure 5, another identified key issue is that the operational capability for the targeting of U.S. long-range weapons resides in CONUS (continental United States) support agencies without the needed back-up in operational military commands. Another area of concern stated in figure 5 is the stresses in resource allocation caused by the Goldwater-Nichols Act. There has been no increase in the defense budget, but the act requires that more budget slices be made. Before the act one worked with four major slices: Army, Navy, Air Force, and defense agencies — DIA, NSA, etc. Now the CINCs are required to be their own budget proponents. It will be the same game but with many new players: instead of four slices, there will now be 10 or 11 slices from the same budget pie. With more contestants, Congress will gain even more influence.

Let me make one last comment related to the increased importance of local and/or tactical conflicts in the last five years. In such conflicts it becomes very important for the local commander to control