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Tailoring C^3I Systems to Military Users
Jerry O. Tuttle

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Tailoring C^{3}I Systems to Military Users

Jerry O. Tuttle

Vice Admiral Jerry O. Tuttle is Director, Command, Control, and Communications (J-6) in the Organization of the Joint Chiefs of Staff. His more than 30 years of service in the U.S. Navy include assignments in the Office of the Chief of Naval Operations and studies at the Naval War College, in addition to active commands at sea. He has commanded attack squadrons and attack carrier air wings, and later served on the staff of the Commander, Naval Air Force, U.S. Atlantic Fleet. Promoted to Captain in 1974, he commanded the USS Kalamazoo *and the* USS John F. Kennedy. *Admiral Tuttle also served as Special Assistant to the Chief of Naval Operations, as the Defense Intelligence Agency's Assistant Vice Director for Plans and Policy, as Naval Inspector General, and as Deputy Commander in Chief and Chief of Staff, U.S. Atlantic Fleet. Among the many decorations he has received are the Defense Superior Service Medal, the Legion of Merit with three Gold Stars, and the Distinguished Flying Cross with two Gold Stars.*

Oettinger: Today we have the great pleasure of having with us Admiral Tuttle, who is the incumbent in that Joint Chiefs Command and Control chair that we discussed a couple of times with a couple of earlier incumbents you have either met or whose presentations you have read. Since you have seen his biography, I will not eat further into his valuable time. Are you open to questions as you go along?

Tuttle: I have no organized presentation. Thank you very much for inviting me. I'm very humbled to be here at this great reservoir of knowledge. Incidentally, on the exam that follows this session today, you can pass every one of the questions by circling "C." Have no trepidations about that.

I've been in this job nine months, having been basically in command at sea my entire adult life. I will talk about the two issues that you have expressed an interest in: the results of the reorganization act of 1986 and low intensity conflict. You can interrupt me at any time and we can go off on any tangent that you want to take. If I use acronyms that you're not familiar with, call it to my attention and if I know what the acronym stands for I'll try to explain it.

First of all, the reorganization act, as you know, is dated 1 October 1986. I arrived on the scene June first of last year. It was just getting started. One of the things it does is, of course, that the Chairman of the Joint Chiefs becomes the single military adviser to the National Security Council, the President, and the Secretary of Defense, as opposed to a committee being the adviser. You know as well as anyone that organizationally it's more efficient and you don't have to have a committee meeting and all that goes with group discussions.

Admiral Crowe, being a POLMIL (political/military educated/oriented) and a very brilliant individual, took over his increased responsibilities in a very measured way. In that, he has a Vice Chairman whom you have met, General Herres, who had the job I have, once removed. The two of them reside in different galaxies. They're perfectly complementary. Admiral Crowe is a worldly POLMIL. He's very personable, and conducts business with levity. General Herres is a programmatically oriented individual and is on the Defense Science

Board, and the Defense Resources Board. He cares about programs and he's extraordinarily well ingrained in the technical field. So they're absolutely a perfect complement, which was built into the legislation because the Chairman himself can pick out his Vice Chairman. The two heavies have settled into this reorganization quite well.

One of the things the reorganization bill did, other than the nickels and dimes stovepipes on the staff, and the incidental people like myself, was that it gave far greater autonomy, responsibility, and authority to the Joint Staff. I have three people I work for. The first is Admiral Crowe who is my boss, and I can relate to that. Next are the CINCs, the commanders in chief of the unified and specified commands, who are the war fighters. They range all the way from low intensity conflict, special operations, as we hear from General Jim Lindsay down in Tampa, to nuclear exchange — nuclear-capable CINCs. The third person I serve is the taxpayer, and I mean that in the most responsible manner and in the strongest possible terms.

The legislation in itself would not have brought this to bear, but one of the things they put in the act is they identified eight to nine thousand joint billets, of which about 10 percent are on the Joint Staff. They're going to get equal opportunity for promotion, selection, and screening for command, the so-called good jobs, with their contemporaries — at least equal. To become a flag officer, you have to be joint duty qualified, which, depending upon rank, determines your tour length. This is a contentious issue now because it doesn't really fit the mold of the four respective services due to competing priorities. In the Navy, which I'm more familiar with, obviously the tour length is a command at sea, and for an aviator that period was lengthy to begin with. With an added requirement for three years of Joint Staff duty, you're a senior citizen before you're up for consideration, or we'll have to change our method of doing business.

With greater responsibility, the Joint Staff must be more responsive. They put a cap on personnel, a little over 1600 — 1627 positions to be exact — on the Joint Staff. Now we have people standing in line to get on the Joint Staff, to enhance their promotion opportunities, as they perceive the situation. In the legislation, to begin with, they set out procedures for the selection, the education, and the length of service. So it's becoming highly competitive in an organization that heretofore was to be avoided — by the Navy particularly. In fact, I'm striking testimony to that because I was the first sailor they even nominated for this job. The other services had viewed it in a somewhat different light for various reasons: population, officer-to-enlisted ratio, flag billets-to-officer ratio. We now have a very competitive atmosphere. So, if you take on these additional responsibilities and duties with a personnel cap, you've got to be able to do things more intelligently, more efficiently, and more proficiently. Your productivity has got to go up, and you've got to have more capable people. And that is actually what is transpiring.

Also, the CINCs' staffs have to take on a different composition. The big things are resources and force management. This comes down from the top, or what you call national strategies. The strategies now, in the wake of the euphoria of the INF (Intermediate Nuclear Forces) Treaty, are getting as popular as California grapes. They've got the competitive strategies, they've got Ikle's* long-range integrated strategy, etc. And all of these will have various supporters because they're done by very brilliant people, but from a different perspective. Probably none of them will ever be bought in their totality because we're in the throes now of an administration change.

All of these will have programmatic impacts on C^3 systems. The CINCs have not yet matured in what they call the planning, programming, and budgeting system, which is where you get the resources to commit against the command and control and communications systems. But they will. Initially they'll take the near-term, maybe myopic — but ignored — short-term-during-my-watch-C^3-systems-and-get-them-in-the-field view. You've heard it many times. This phenomenon has to be balanced against long-term goals, and I look at this as my responsibility, being in the senior uniformed C^3 position in DOD. It is my responsibility to make sure there's a balance between the near term, short range, get-the-radio-in-the-hands-of-the-kids-on-patrol, to supporting the long-range strategy of nondetectable antijam satellite communications, or talking to Voyager on the other side of Pluto. That will come and mature. On balance, I think it's clearly the right thing to do.

If you look back to a time in history when I was in the Mediterranean, I was far removed, but I heard ad nauseam about Grenada and the interoperability issues. If you took a snapshot of that day, we've come a long way in interoperability.

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*Fred C. Ikle, Under Secretary of Defense for Policy.

That is one reason that the reorganization was done. It brought us into more unity. We do far more joint exercises and operations today. The Vice Chairman of the Joint Chiefs of Staff is also the chairman of what we call a Joint Requirements Oversight Committee. Any program that starts up now, particularly in the C^3 world, has to come before it to see if it has applicability to being joint, to where you might even get joint development to avoid duplication of development effort, and to achieve economy of scale. He chairs this with the chiefs of staff of the services.

Now, C^3 systems, more than tanks, ships, and aircraft, have a greater pervasive application for jointness than any others and are, quite frankly, you might say the glue that draws all of the disparate elements together. I won't go into detail to see how initiatives have been taken to achieve equipment commonality and interoperability, but I will point out that an ongoing success story, after a brief period of time — Grenada hasn't been that far past — is in that cul-de-sac at the base of the cradle of civilization, the Persian Gulf.

You have U.S. Navy ships escorting reflagged tankers from another country. You have French, Belgian, Netherlands, British ships in a link with AWACS from the United States and Saudi Arabia. You have the joint task force commander in the North Arabian Sea, and his boss halfway around the world, 7,000 miles away in Tampa, Florida, at McDill Air Force Base. His Navy component is in Hawaii and they have secure communications to all, including all the Gulf Coast state embassies — certainly their Navy units do, and in most cases their Air Force — in an area that nine months ago was basically a desert C^3 area. It's what we like to call a C^3 infrastructure — a real success story.

Oettinger: Your assertions sound so radically different from what the class has read from the record. Would you underscore what is radically different here?

Tuttle: Well, it's working. In the Middle East we're taking VW-7s and converting to SG-50s. We had a paucity of satellite communications and we had to go to using what we call DAMA (demand assignment multiple access) to get greater efficiency from our satellites, freeing up two channels of the UHF satellites. It led us to interfacing an SHF satellite with a UHF satellite, which we had never tried before. C^3 is complicated, incidentally, by deconfliction with what was heretofore at least perceived as an adversary, not an enemy — Iraq, working out deconflictions following the *Stark* incident — in the midst of a lot of commercial traffic. You have a lot of activity, in a small hostile area, but we have created a system in which we can go either way around the world, east or west, by multiple satellite hops and be able to see in near-real time the force disposition in the Persian Gulf. The on-scene commander, the CINC in Florida, and the National Command Authorities in Washington can all share the same real-time picture. I'll elaborate on this later.

In my estimation, the reorganization was the right thing to do. I exploit it, because I'm the chairman of what they call the Military Communications and Electronics Board, or MCEB. The only time I go to Admiral Crowe, or we have to take something up for the heavies, is when "I'm a failure." If there's a C^3 problem in the armed forces, it's my problem. The purpose of this Military Communications and Electronics Board, which is now meeting quite regularly, is not pomp or even to philosophize, but to solve problems. It's a very big thing. We don't care *who's* right; it's *what's* right, and we do what the right thing is. We've created good chemistry. I think there's a realization of the increased role of JCS or of what I represent in this business, and I must be sensitive to their concern, because at this juncture the services still hold all the purse strings.

Oettinger: Before you move on, would you go back for a minute to what you were saying, specific to the Persian Gulf — the act of 1986 helped in what specific way? If you put yourself back in what it might have been like if you had to do the job before that, where would have been the rubs? Where do you now have clout or means that would have been lacking?

Tuttle: First of all, one of the provisions relates to the joint task force commander — that bridge with one foot on each side of two CINCs' area of responsibility (AOR). He steams from one CINC's area of responsibility to another and controls basically the forces in the other CINC's AOR. Admiral Crowe has much more autonomy. It is not necessarily so much a reorganization, but a culture change that has occurred.

It used to be that a commander in chief did not want others in another part of the world knowing as soon as he did what was going on in his AOR. He was very reluctant to share anything that was not filtered by him, because he did not want some civilian, or even the Chairman, or anybody giving him so-called rudder orders on how to run things. There was always this great trepidation, I think more pronounced in sailors. However, once we found out

that we were dealing with at least a common database on the Earnest Will* operation, CINCCENT permitted this to happen. To get that, connectivity went through EUCOM, another unified command. It just so happened that it terminated at CINCLANT, which is another unified command, and to ensure we had connectivity, we cut through CINCPAC's AOR. So we literally circled the world. Once that showed success — not a word was mentioned about how to carry out his (CINCCENT's) operation — it broke down long-standing cultures. I think this will literally last throughout, and permit me to do what I want to do. I'll cover this off-line after we cover the reorganization topic.

Right now because of the dynamics of the thing there's probably nothing that any organization couldn't have handled. It's certainly more efficient now. I happened to be in the East Mediterranean, in that little cul-de-sac, from 31 January 1983 when the Druse started sniping, until August of 1984. A lot of the time I spent in the East Med was comparable to what is happening in the Persian Gulf. In the Eastern Mediterranean, we were sitting there with a French carrier battle group and the British, watching the Israelis run reconnaissance flights daily, and an occasional strike. The British flew out of Cyprus. The Italian ships were on the gun line. All were in a link. No one was designated as a joint task force commander, but they were looking for leadership and they essentially let me command and control, basically for selfish reasons — survival — and not to have any blue-on-blue engagements, friendly-on-friendly engagements, or fratricide. We were confronted at the time with a postulated threat that covered the spectrum of what anyone who had played Dungeons and Dragons could imagine — from hang gliders, to swimmers, to C-47s laden with explosives.

I didn't answer your question. The new means we have include the joint task force commander and Admiral Crowe being able to make the decision. I think there's a staff more responsive to Crowe. There's some amelioration of what I call the "sunflower syndrome" — that when you get inside the Beltway you don't always look up. There's being generally concerned for the people in the field. I think it has worked very well, and I think that General Crist, CINCCENT, is pleased, and we certainly are with what he's done.

*Operation Earnest Will was the overall U.S. program for reflagging and protecting shipping in the Persian Gulf.

Student: I have a question in regard to the Persian Gulf operation. When we did have this excess demand from the operations themselves, was anybody kicked off the channels of the satellites?

Tuttle: No. We never had to. We got down very close to kicking the embassy in Beirut off one of the UHF satellites. We were operating off the same satellite — the Indian Ocean satellite. We employed DAMA, which is a four-channel multiplexer, enabling us to free up two satellite channels, channels 5 and 12 to be specific, and it took alteration of two PACFLEET ships to be able to bring it about. So two ships out there were tying up four channels as opposed to putting this very inexpensive device on — the multiplexer — and then activating multiple access put on two ships. Now all ships that go to the area will have this capability.

Student: Can we expand the capacity of that use?

Tuttle: Sure. DAMA is only a matter of being able to multiplex and use two channels as opposed to four.

Student: It's an efficiency measure.

Tuttle: Precisely.

Student: Do you mean that now the Navy, for instance, will have the same ability anywhere in the world, in any waters, or was this specific to the Persian Gulf?

Tuttle: First of all, satellite channels have to be prioritized for any area of the world under any given situation in which we find ourselves. It has been said that the Navy has become too dependent upon satellites — I didn't say just UHF — although the LEASAT (leased satellite) and FLTSAT are ours and we use them extensively. There is the DSCS (Defense Satellite Communication System), the SHF, which is becoming pretty robust. We've got three of the DSCS IIIs, and two of the DSCS IIs. We'll start launching again in December of 1990 or February of 1991, putting up the additional DSCS. We have a UHF satellite follow-on program which will be putting up additional UHF satellites to take care of administrative traffic, and, during peacetime, C^3 systems.

We'll fall back on AJ (antijam), and eventually when the Milstar (EHF) gets here, it will have antijam protection. But the antijam satellites are scheduled to be launched. What is also transpiring right underneath our noses — transoceanic — is that an economical alternative to satellite communications for getting the communications capacity — a much greater capacity I might add — over to terra firma, albeit to another country, is fiber optics. You're not

going to string it off the stern of a ship, but it will free up satellite channels for naval use.

Sixty-five percent of the traffic that is being pumped over the air waves today is for intelligence, and that will go up drastically during a crisis. First of all, we're using a capitalistic system to cut down on the communications diet, and that is, you pay for what you use. For communications services in the industrial plane, which is like Ma Bell, if you want to put in a phone you pay for it. That's how we hope to cut down on the user's appetite. I have no trepidations that we'll have enough communications. It's how we package it and how we utilize it for ships at sea.

It is no longer good for that ship, that task force, to communicate only with its ships from the same nation. You've got to be able to communicate with your allies, and it may not just be NATO or bilaterals. And that's the point I was trying to make, but didn't articulate very well, about the Persian Gulf. That's a beautiful thing in the Navy program. We can steam anywhere, and basically in a small period of time can set up communications. I alluded to it in the Eastern Med. It doesn't make any difference about the location. The worst possible place, as far as the paucity of organic communications is concerned, is in the Indian Ocean.

Student: To some extent, the whole setup is wonderful, but in your statement it seemed that when they experimented and started to emphasize C^3 it was not guaranteed, so they picked up the satellites. Are they also making an effort to try to fix their coverage in other areas?

Tuttle: Yes, clearly. That's a good point. We have that debate all the time with the tactical commanders, not communicators or C^3ers. There are some who will not depend upon satellites at all; some become overly dependent upon them. The highest density of satellite terminals that I know of is in Alaska, and they're heavily dependent upon satellites. Of course, you can always use a small LST-5 or a PRC-3 tactical satellite transceiver and set up satellite communications.

The arguments surrounding satellite communications range from their being jammable, over-subscribed, to their being knocked out by ASATs. There's some degree of protection on our DSCS satellites and even more protection in the follow-on Milstar program. The physics hasn't changed since the spectrum was understood to go from DC to light. It's just how we dice the spectrum up, and what smart things we do with it. Someone mentioned the art of HF and that becomes very emotional rapidly. We have been playing around in the Navy with what they call an HFAJ (high-frequency antijam) which uses basically a spread-spectrum frequency agility method. That smacks immediately at the heart of frequency allocation in an already crowded spectrum. So then you come up with, "Who cares in time of war if you disturb cartoon carnivals in the Central Front?" to the point of being able to exercise using HFAJ. Anyway, the HFAJ program ended up crashing under its own weight.

There's a point that should be made. When speaking from a dais, we tend to talk about command and control. It has great connotations. Command and control. When things go to hell, it's those damn communicators. What you're actually talking about is connectivity. When we recently went into Honduras we had units in different crypto key lists. We've come up with a common crypto list, a managerial thing we should have done years ago. It's an intertheater cryptological program in which, if you come into CINCSOUTH's area of responsibility, we're all going to use a given key list. In spite of that, our 7th Infantry Division and the 18th Airborne arrived in theater not using the right edition of the prescribed key list. So it becomes a problem of adherence to procedures.

Now, is that the C^3er's fault? It's a systemic problem. Everybody went back and gave me an audit trail and told me how ugly the kids were, but no one came up with a system of how we were going to prevent that from happening again. We've got to make sure that we have a checkoff list, i.e., communications, electronics, instruction, orders, etc., to the point where anyone who can read can comply and communicate.

Oettinger: Could you clarify that a bit more, because that particular problem has a long, long history.

Tuttle: We practice our mistakes.

Oettinger: Can you compare that to the rate of similar failures? Forgetting to bring along a hand-carried weapon or munitions for airplanes or whatever, is this a matter of renewal? You've got young kids and have got to keep training them? Or is there a real differential between C^3 stuff and everything else?

Tuttle: It probably goes back to the central front, to the Battle of the Bulge. They couldn't keep providing gasoline for the jeeps. I guess you could call it logistics. C^3 systems are no different. They must be planned for. You would never have known about the faux pas in Honduras if I hadn't told you, be-

cause no one got killed. But I take it as a responsibility to make sure that it doesn't happen again. We've got to jump on those things. At least they were all on the same frequency. At least they had commonality of equipment. Those are the easy things.

Standards are another major factor in interoperability. The system to create a standard used to be dominated by the United States military as the big customer in the world. But we're no longer the driving force. Private industry is the biggest influence.

In the United States we almost lost the television standards battle to the Japanese. We've got to make sure that U.S. institutions are promoting interoperability. I have confidence that we're improving in technical standards and in setting standard operating procedures. I need to get at least a generic checkoff list, or instruction, for the CINCs to use as a standard. It was in the operations order for the Honduras exercise to use an intertheater cryptological planning guide, but they didn't do it. That's like the pilot forgetting to put his landing gear down.

Oettinger: But he has an incentive to exercise.

Tuttle: That's right.

Oettinger: If I hear you correctly, in the past, in this area, there have been excuses about interoperability, whereas in that particular incident those excuses had run out. Essentially it was exercises. It's an old-fashioned problem.

Tuttle: Exactly. We used not to make any great attempt to be interoperable in spite of proclamations. But now there is a commitment to interoperability by all services. I was out at Fort Leavenworth the other day with every service represented. You seldom saw that before. First of all, I would never have gone to Fort Leavenworth before unless I was taken there in another capacity. But we all assembled there at Leavenworth to talk about EW (electronic warfare) and ECCM (electronic counter countermeasures). Not one indication of parochialism was apparent. I have a very warm feeling that the reorganization act brought this about in large part, plus the fact that we are driven more together by exercises. I can remember back in 1981 when it was a watershed that the carrier battle groups were able to link with the AWACS. We were faulted then in some circles because, being a carrier battle group commander, I was working with the Air Force's 522nd AWACS squadron. Now it's routine for carrier battle groups and AWACS aircraft to interoperate around the world. We've come a long way.

There's truly a spirit of cooperation that never existed before. I think there's also a greater appreciation for joint operations.

Command, control, and communications systems have fared very well, funding-wise, in recent years. Where the rest of defense spending, over the last eight or nine years, went up 18 percent, C^3 system funding went up 37 percent. Of course, our gradient in the cuts had been somewhat greater, although not devastating yet.

You can look at our strategic connectivity master plan, which is basically worldwide, and see what that increased funding has provided. Critically analyzed, you can make it optimistic or pessimistic, and show what it means as a force multiplier. You can see how many weapons it takes Ivan to degrade our C^3 systems to a lesser degree than just three or four years ago, and how much more time the plan gives the commander in chief to respond, which gives him all kinds of additional options.

A while ago you were talking about our dependence on satellites. We were going to be down to two UHF satellites in 1991 if we didn't get a UHF satellite follow-on program. That was removed from the 1989 budget and immediately put back in because that cut was clearly not the right thing to do.

Remember I said it wasn't good enough talking amongst the four services, or even among our allies. We've got to talk to our agencies. That's another thing the reorganization act did. The reorganization act also charges the Chairman of the Joint Chiefs of Staff to evaluate the various agencies. That means that the Defense Communications Agency, Defense Nuclear Agency, National Security Agency, Defense Intelligence Agency, etc., are to be evaluated.

During low intensity conflict you must work with the State Department because the ambassadors need to be kept apprised of what is going on in their countries. You've got to work with their country teams which may or may not be fully informed. If they are uniformed personnel, they may be working for another agency under a different name in an area which probably does not have the necessary infrastructure. Stress on more positive control normally would exist because of the potential for escalation, and more important, for disengagement if you wanted to de-escalate.

Now having said all that, a subset of this is the creation of a Special Operations Command under General Lindsay. The reorganization also gave all of the CINCs the ability to give a sit rep (situation report) or a report card to the Secretary of Defense, but through the Chairman of the JCS. The law is

not written that way for the Special Operations Command, although in practice it is done. CINCSOC actually has unique technical requirements and operations requirements. EUCOM and PACOM both have their special operating forces. They've upgraded those units to a one-star level. They do all those unique things that they are called upon to perform across the spectrum of conflict from low intensity conflict to general war.

A lot of those things you might be able to imagine for requirements in a technical sense are requirements that you don't want to be detected. You've got to have a great degree of confidence that you're going to get your communications through; C^3 equipment must be lightweight, rugged, and reliable whether it's meteor-burst or satellite equipment. Fundamentally, it's now broken up into three functional areas. You have special operating forces that come off the SEALs (Navy Sea-Air-Land units) that do things that require getting wet. You've got the people who fly aircraft — the whap-whaps. Then there's the Army with the snake eaters, and the amalgamation of others. They're a very elite force, I might add. They exercise extensively. In fact, one small SEAL team shoots more practice ammunition than the entire Marine Corps. They're very professional, and they have very special communication requirements, all the way from reconnaissance, as you well may expect — lightweight, wideband, real time — to low probability of intercept. And we're working hard to satisfy these very special requirements.

The new CINCSOC command came into being on the 14th of April last year. They're still fleshing themselves out as far as the staff is concerned. They're building up chemistry, evolutionary relationships, and the command relationships with the supported commands.

One C^3 resource that we have for contingency operations is the Joint Communications Support Element (JCSE) down at McDill, run by an Army lieutenant colonel, a super leader. We can basically support two joint task forces. They can support basically four skirmishes with this highly deployable unit. It is deployable but it's still too heavy and has too much in cube. Its C^3 equipment must compete with other logistics requirements. It's an ongoing effort to miniaturize and modernize this C^3 equipment.

To digress a little bit — one of the greatest requirements for the JCSE is interoperability. The first criterion for interoperability is a standard. In 1955 we set a standard for a 19-inch rack; I guess that was the width of the bulkheads. Now you can go around and literally see less than 10 percent of a 19-inch rack being utilized. In fact, for a Racal receiver that's being built in Japan, we're paying $5,500 more a unit to put it in a 19-inch rack, when their packaged unit is about 6 inches square and half as long. So everybody's very obediently following the standards. Now we need to change the standards where it's called for. Aviation is driven by the necessity of getting a required function into a limited space. We need to strive for smaller, lighter weight C^3 systems.

Student: What about communications with those people like the government of Honduras? Are we taking steps so that the armed forces can communicate with the embassies? What about if we had to go in and work with the Hondurans?

Tuttle: We are right now. As a matter of fact, one of the contentious issues right now is that we have two satellite channels there. We have a contract being let with the PTT — Post, Telephone and Telegraph of Honduras — to take over basically all of what we have now, buy it from them commercially.

We have two TSC-85Cs down there, and each one of them has more capacity than all ships at sea in numbers of satellite channels.

Now for a success story. In Panama it was a different ball game. They were on the poor side of the trough as far as the C^3 systems were concerned. They were getting the technical capacity and equipment, but I hadn't prepared them or trained them on how to use the capability they had. They had more capacity than they were able to use, let alone exploit. They've come aboard and they're doing superbly with the Worldwide Military Command and Control System (WWMCCS) which they didn't even know how to log onto when I was down there in December, and now they're actually running operations and the entire logistics flow.

Of course, you'll always have your diplomatic communications. My generation likes to have voice-recognizable communications — "Hey, John, this is Jerry." In my way of thinking, that's just a very small part of command and control. Command and control results from fully analyzed and verified data. We must analyze data as opposed to handling data.

Oettinger: Before you go on, I'd like to put what you have talked about here in context, and put what we talked about over lunch on record, to see if I'm painting an erroneous picture for you and give you an opportunity to correct it as it goes along.

I'm impressed by the kind of watershed quality of what you're telling us, if you read the record of the seminars. It isn't that problems are going away; there's always another layer to the onion. Something always gets screwed up. What is different is that there is a quality of change to the nature of the failures. This says that a whole layer of problems that have been perennial have in a sense been addressed to a point where it opens up to a whole new layer of the onion.

Let me try to be specific. Whereas in past years, we heard a great deal about connectivity and the absence of connectivity and so on, that does not come up in much of what you say. You say that's pretty good, and where it hasn't been you've been able to deal with it — a very different flavor from what we've heard in past seminars. Second, even when there was connectivity, there was "What has Maine got to say to Texas" — a Thoreau-like situation, although a little more poignant, because folks wouldn't talk to you even if they could: that was the cross-service and jointness thing.

The legislation may not have gotten it solved, but I sense in what you're saying that things are much better, and it's about to shift more. We take that for granted. Folks can talk to one another if they want to; if somebody has a 2 × 4 or a candy bar or whatever and is urging that folks might want to talk to one another. But what do they have to say to each other, and what is the quality of it?

Tuttle: As a matter of fact, when the Earnest Will concept of operations was briefed to the Chairman and service chiefs of staff, on everything such as where the ships were going to be, what aircraft were to be where, etc., the brief was concluded, and everyone talked exclusively about command and control. The CINC looked at me and said, "What can you do?" I said, "You tell me what you want to command, and what you want to control, and I'll be able to get the connectivity." The entire discussion was on command and control relationships.

If you talk to any commander, and I've done this my entire Navy career at every echelon, you don't ask the commander what he wants, because he does not know what he wants. It is a fact, and I said this at lunch, "No system is any faster than its control mechanism." If you command and control by voice communications at the maximum communications data rate of about 300 words a minute, it's too slow for many situations. Our C^2 is overly dependent on paper.

Did you know that there's never been a terrorist event where data and reports were not available that would have predicted the event if the reports had been timely, read by the proper persons, and the data properly analyzed? In 1981 there were something like 11,000 messages a day that had keywords in them like "sabotage," and "terrorists," and less than .1 percent of them were ever read. Think of all the resources that generate those message inputs, and how you condense the inputs into a meaningful form. We just *handled* the data. We weren't *analyzing* it, because we never had it in the form in which to do so.

In fact, why I'm probably here is because I've had a lot of command jobs. I have a pretty good appreciation for what I need to make a command decision and what is needed to control forces. There are a great number of people who are brilliant and know a great deal about the spectrum of modulation techniques and the nomenclature of equipment, and even how to make systems interoperable — whether they be bit-oriented or character-oriented, etc. So, I see my role as being able to take this technical community and communicate to those people — the commanders, the Crowes, the Herres, the unified CINCs — particularly those in my generation, who didn't grow up with PacMan and Apple. Frankly, there is some resistance because of a generation gap and a required change in culture. It is very easy and natural for them to read a message. I'm convinced that some people are creatures of habit — they go to work, have a cup of coffee, and read the message board. You take that away from them and they'll crash.

You can't ask a commander to stand over a radar repeater endlessly to observe the environment so that he can make command decisions. There are multiple symbols and he becomes bored after 10 or 15 minutes, so whom do you have there running your battle group? You have a young lad, the technician we were talking about earlier today. If you keep him at sea for 30 days, four hours on, four hours off watches, his motivation and attention to detail deteriorate and his world becomes the scope. I don't want that guy commanding and controlling my battle group.

The total environment, i.e., friendly, enemy, neutral forces, has to be depicted in a manner that shows relationships to each other. Remember the old World War II movies? They used puck movers. You've got to know where Ivan is, or the adversary is. You've got to know with great fidelity where you are. When you shoot squirrels you've got to

know where you are, what the Kentucky windage is, and where the damn target is. It helps to know what time of day it is in a targeting solution. You all have these things, d=rt, the time/distance thing, routine. You guys are the smart ones.

You put all of this data in a database and then you find out with what granularity and with what degree of accuracy you want to depict it. It may be okay for the President, even for Admiral Crowe, to know that USS *Enterprise* is in the North Arabian Sea for today. Probably the CINC out there would want to know with great specificity so he knows what his time/distance factor is to send USS *Wichita* up to replenish it. But if the on-scene commander gets intelligence of an F-4 coming out of Iran, he needs to know what the degree of urgency of this intelligence is and if he has friendly forces in the area. He doesn't have time to ask the questions; he's got to be able to *see* the relationship between the F-4 and his forces in near-real time.

You could go out and you could create a large database. I maintain that most of the required data exists. All I want to do is pull together the available data into one database for everyone's use. We have great vacuum sweepers in orbit, but we have a systemic problem. The apex for most of our sensors is intelligence types and J-2, understandably so. If I create something to serve me, I design it from my perspective. The guy with the ultimate responsibility, or the CINC, who gets fired or fights another war, usually has more information on enemy forces than he does on his own. The intelligence officer is in one room, concerned with the red data, and he doesn't care where the blue forces are, the blue meaning friendly, and more importantly, where the neutral units are. I'll take you to my little scenario at sea: apart from the humanitarian aspects, you don't want to put an expensive Tomahawk, which is in limited supply — or Harpoon on a Texaco tanker, or on one of your own units when you're shooting at the enemy. You're talking about target discrimination and force-locating data on over-the-horizon targets.

We have just promulgated, after three years, a pretty damn good document: a wide-angle surveillance, target and tracking statement of requirements. I want to use data from all orbiters, from air breathers, the two eyes on the bridge reporting in machine-readable formats and inputs from all sensors in between these extremes. Data entry must be automated as much as possible. Users at every echelon can tailor this data to suit their needs and *analyze* it.

I want to be able to bring data from all our expensive collection sensors — which exist today — into one fusion center. I know what data is needed in nautical situations from the guy on the ship to the four-star level because I've been there. In fact, I created a lot of that capability. Now I've got to find out more what the Army and Marine Corps commanders need. As an aviator, I know pretty well what data the Airedales need, i.e., SAC and MAC; I don't know totally what data the corps commander needs in the Central Front.

We need to build command and control systems. I've heard correlation, I've heard fusion, I've heard all this my entire career. I've seen vugraphs but I've only seen one true example of a fusion center. You have to grow a fusion center in an evolutionary manner.

I've had commanders, my bosses, tell me, "Why are you giving that information to me, Jerry?" and two weeks later they would kill for it. Let me give you an example of what an impact a command and control system had on operational readiness. CINCLANTFLT used to bring in a lieutenant commander to prepare a unit status report for the CINC. You talk about having Babe Ruth bunt. He'd use colored pencils to depict the unit statuses from the unit situation reports for all the ships deployed in a carrier battle group (eight to twelve ships). He would come to work between 3:30 and 5:00 o'clock in the morning and prepare the CINC's morning brief by color dots on a vugraph to show unit readiness. I showed them how they could automatically extract readiness data from the database and depict it in color. When we started off, because of limited personnel resources, we monitored only the deployed carrier battle group. But as our computer program materialized we started looking at readiness data on carrier battle groups approaching deployment. Finally, we were looking at the readiness condition of every unit in the Atlantic fleet. The further away from deployment expectancy, the less the readiness posture was. Nevertheless, the type commanders did not like their kids to be called ugly and so they started concentrating more on their forces and readiness improved. A C^3 system was not being used as a management tool. The type commanders didn't want to see the red and yellow dots that indicated reduced readiness. They wanted to see the green and blue dots. We would review the entire CINCLANTFLT's force, 60 percent of your Navy, every morning in less time than it used to take to cover 12 ships.

The foregoing had a profound effect on readiness. By more easily and efficiently monitoring the readiness of our ships and squadrons, we were able to identify problem areas. As an example, we found that we needed to make personnel assignments earlier in the training cycle so that they could benefit from the work-up training periods. It's a command and control tool that readiness greatly benefited from and Lord only knows what savings accrued.

Oettinger: May I put in a word from the house on that comment? The problems and successes that Admiral Tuttle described are not unique to the military situation. One of these that is of recurring interest comes under the civilian heading, and there are histories elsewhere that one can learn from. As one brief example, because he stressed some of the positives, there are negatives, which goes back to why it's so important to have a look at the whole institutional picture. Some years ago one of the railroads began to go with a system where it kept track of where all the freight cars were. There was not universal gladness among all railroaders that the management was able to do that. In particular, regional managers who used to squirrel away freight cars in order to carry their own goods were awfully annoyed when orders came from headquarters to shift the cars around. It was not altogether venal, because when top management started moving around the cars they screwed it up, and nobody had cars in the right place. So, the regional managers said, "I told you so." But still over the years that got smoothed out, and the cars don't all sit in one freight yard waiting for the next shipment of lumber, or grain, or whatever. They're moving around, anticipating the next need. I just wanted to add that to your comments: first, that there are similar problems elsewhere, and second, that not everybody is always keen on being helped.

Tuttle: As a matter of fact, the railroads were the first to use bar coding. It was very crude bar code, done with a paint brush. They would simply count stripes to identify freight cars. We are now keeping track of classified documents using bar coding as opposed to an endless chain of chits and papers. We bar coded classified documents and they were entered automatically into the computer — machine readable.

Bar coding has little to do with command and control, but has everything to do with the way we approach life. I prided myself on being able to lead people, and then, as I became more senior, squadrons, air wings, ships, battle groups, and fleets. I find my challenge now is to lead a system. All these people I told you about, a rosy scenario of all those very talented and intelligent people, come into my staff, but they're bound by procedures they call MOPs, i.e., memoranda of policy. These MOPs tell you to go from A to B to C to D. It's a series function and if you follow them, you will spend your tour of duty and never get your fenders bent, or make a mistake. What that does is to create flawless management. It breeds compliances. They always do the right thing, but never exercise their judgment or wisdom, nor does the system permit them to use leadership, or do the right thing. This is a systemic problem.

How one leads such a system is akin to having one foot on each log and is very difficult. Obviously you have to have standard procedures in any large organization, but you have to beware that rigidity stymies or deters initiative, a luxury you have in the academic world. A rigid system stymies motivation, and does not give you the self-satisfaction that you, as opposed to the system, achieved something today. Achieving the correct balance is one of my challenges.

Another challenge that I have is to lead in changing the image of the C^3er. At this table, you and I have used "C^2," and "C^3," and "communications" not always, but often, incorrectly. I need to ensure that we do not use these terms indiscriminately. I want to create a worldwide C^3I system that everybody can use and that has a common database. As a matter of fact, you'd be able to correlate electronic intelligence with intelligence from other sources.

By everyone having a common database, only changes to that database from any sensor source need to be transmitted, which will reduce communication requirements. Admiral Crowe will be concerned with the world. Admiral Hayes in Hawaii will be concerned about his AOR, and will determine what he pulls up from the database. All he wants to know is where blue forces and the major red combatants are. Whereas Rear Admiral Tony Less, the Joint Task Force Commander in the North Arabian Sea, wants to know more about his environment to a greater granularity, and he does it by profiling the database by emitters, geography, and range of weapons sweep, both the enemy's and his. The database can be further tailored right on down to the ship commanding officer who wants to get a Tomahawk or Harpoon targeting solution. He has got to know more about his environment so he doesn't have a false target and can achieve target discrimination. All of the foregoing can be served by the same database.

Student: What you're talking about is precisely what our research project is concerned with this year, and that's the marriage between intelligence and operations C^3I. How do you make what you're talking about really happen from your level, based upon the fact that the agencies that you're talking about — the NSA, DIA, CIA, maybe even the National Reconnaissance Office, the players on the J-2 side — don't really fall under your purview? They may, in fact, not fall under the Chairman of the JCS's purview, or under the Secretary of Defense's purview. There may be some argument about that when you're concerned with, let's say, NSA; I'm not quite sure whom they fall under.

Oettinger: As you were asking your question, my mind slipped back about 25 years. I was on a task force that the White House had on management of the intelligence community, and ran across a forum called CODIB, which was the Community Data Interchange Board from the USIB, which was the United States Intelligence Board; similar groups still exist today. All these were drawing together various databases of the U.S. intelligence community, and this was under the aegis of the Director of Central Intelligence and the President of the United States, and the problems mentioned in your question did not exist. We were dealing with the right reporting hierarchy. Again, what Jerry described as a great good is not uniformly perceived as a great good, for a variety of reasons. But I remember going over tons of documents and talking with any number of people who in my sense of chronology were resisting any movement toward the direction you were advocating by pointing out that it was difficult, if not impossible, for us to take data that were punched in different columns on cards and overcome the technical problems necessary to move something from one of those databases into another. I think something on the order of five years went into these grinding discussions which looked technical, while of course their role in the mission was to thwart the kind of thing that Jerry was talking about. That was 25 years ago. So the problem that the question raised here is one which has a great deal of history. So, Jerry, as you develop your thoughts, could you talk about countermeasures and cons as well as your vision of what is the good and the true?

Tuttle: First of all, it never occurs to me that I'm ever going to lose. I'm a born optimist. Lieutenant General Bill Odom regrettably is leaving as Director, NSA, and he feels the same way as I do. But nothing noble is ever accomplished that is not first impossible. Carlyle said that, I believe. However, it's better to light the candle than to cuss at the dark.

A year ago you would never have thought about sitting and watching what's going on in Europe in near-real time in the Pentagon. You couldn't have done it. But now the walls of the CINC's AOR have broken down. I was the most popular three-star in the entire DOD when I piped the link picture of the Persian Gulf into the Pentagon, because I got a call from every four-star in the DOD asking what the hell I was doing. The other thing is there has never been the tenacity to do it. Irrational things like taking a sledgehammer and knocking down the wall between the intelligence and command centers at CINCLANTFLT. That's visible evidence that you're going to fuse C^3 and I, or you put the FOSIC (fleet ocean surveillance information center) officer in back if he doesn't put the post terminal (electronic intelligence correlator) into the command center. So there are all kinds of ways that you can get their attention.

Student: My question on this, sir, is, where is the support coming from to do this type of integration?

Tuttle: Eventually from the CINCs, the war fighters. Let me give you an example. The system I was putting together was grown from grass roots. When Admiral Trost, now our CNO (Chief of Naval Operations), was OP-090 and controlled all of the Navy's money, he was adamant against my system. I became his deputy — and why he ever selected me I'll never know, because we never met intellectually, but we had great chemistry and I really admire the man — he gave me $225,000 to start a system for CINCLANTFLT's command center. He came back after he was CNO and he looked at it and said, "The only thing wrong with it, Jerry, is that your system didn't cost $2 billion." Now he is a strong supporter of the system.

Admiral Kelso, who relieved Admiral Trost as CINCLANTFLT, recognized the value of the system and became a leader in expanding the system. He now personally ensures that the data that originates from his command center and goes to the world is accurate.

Oettinger: This seminar owes a great deal to Bill Odom, because in a sense it began because of Odom's idea. From the way that thing went, and the reason for telling you this, is that the other actor in this was a student at the Kennedy School, a captain in the U.S. Army, who happened to have been assigned for the summer to work for Odom, who was at that time a colonel in the Army who worked

for Zbigniew Brzezinski, who was at that time the National Security Adviser. Odom and Tom Leney had worked on a piece of a presidential directive, about which in retrospect they were wondering what the hell they had been doing, and I got an indirect phone call from this captain, who asked if I could look into it. And I got seized with the question and decided to pursue it by looking at it some more and creating essentially the first version of this seminar. Why do I want to inject this note? Because I think the contrast between saying that folks are in opposition and the optimism that Jerry has is that when there are people like Tuttle and Odom who are in the system long enough, then little by little they can begin to make a difference and the system and institutions do change. But it does take a certain amount of patience and risk, because it won't necessarily happen tomorrow. It's sort of fascinating to see the pawns put on the board umpteen years ago still moving around — by and large forward.

Student: Admiral, as Chairman of the Military Communications and Electronics Board, you exercise leadership over the community in Washington, but you must have a special relationship with your equivalents on the staffs of the unified commanders. Do you find that their problems have a lot in common with each other, or are they, in fact, a lot different because of the different geography?

Tuttle: You are sagacious. Through the MCEB I have personal interface with the C^3 community in Washington and we all have good chemistry. I have built a strong relationship with all of the J-6s on the CINCs' staffs. They naturally have varying requirements because of the geography of their CINC's AOR. I try to maintain credibility with them and let them know that I represent their unique interests in Washington. I try to communicate with them individually or collectively as a community, over the WWMCCS. With the MCEB I try to solve mutual Army, Navy, Air Force, and Marine problems.

The MCEB relationship is a cooperative one and it's a "How should we skin this cat" body. The relationship with the C^3 people in the field is "Let me know your problems and I'll be your representative in town." They are different relationships, but all concerned have similar C^3 goals.

Student: At lunch you mentioned that there was no command center anywhere. Is that the fusion center?

Tuttle: Yes, that's right. Let me give you an example. What's driven me, why I'm in this job today, is I used to go aboard our Navy ships, and it would be just like walking inside a 55-gallon drum. Then I started, much to the chagrin of Washington, building a system, and I looked like a hardware store moving from one ship to another.

We created a system that we called JOTS. It's a perfumed name for Joint Operational Tactical System, when it was really the Jerry O. Tuttle System. There's a message here, because I don't know an electron from a baseball. But I created this system out of frustration and necessity. I had a bunch of hard work guys on my staff who were staying up all night putting together schedules. I said, "This is terrible. These kids' eyes look like road maps. There's got to be a better way." I knew enough that any information that you could put in a matrix you could have a computer assist. So I started off on a basic desktop computer as a tactical decision aid. I didn't want my intelligent guys, people like you, sitting around and memorizing information that fit into matrices that somebody would change in a week. I wanted something where you could hit a key and come up with a candidate ship for an intercepted topsail, or gun dish, etc., radar signal. I wanted my officers to do "thinkums"; to be able to take the disparate, complex parts and mold them into a whole or do things only humans can do.

I built on this tactical decision aid when I arrived in the East Mediterranean. We went from one target to five targets to 28 target sets (multiple targets). That's a thousand moving targets, so I needed a management information system. I grew the system literally on the back of notebook paper.

I needed to avoid detection by Soviet satellites. It used to take two of my people six hours to make out the footprint for one RORSAT (Soviet Radar Ocean Reconnaissance/Surveillance Satellite) pass. If I have a carrier battle group doing eight to ten knots, it can't sprint and get out from under a footprint of a satellite, i.e., RORSAT. People could do it, but it was too manpower intensive. I said, "Hell, if you can do that, a computer can." So we wrote a satellite vulnerability computer program. We challenged the parameters given for their satellites and we found that they were flawed. I also found out in 1982 that a program that we bought in 1977 — and paid for — never got incorporated into our NIPS (Naval Intelligence Processing System) database: to show the true footprint of Soviet satellites!

We have ships that do not have a Link 11 capability. By providing them desktop computers and transmitting to them our fused picture via OTCIXS we were able to provide the non-NTDS (Naval Tac-

tical Data System) ships a total picture of the environment. OTCIXS stands for Officer Tactical Command Information Exchange System.

I grew this fusion system as I went from a plastic one-star (selected for flag) to a two-star at the numbered fleet level, and then as a deputy CINC. I used my system and observed CINCLANTFLT's reaction to determine what information he wanted/needed and in what form he wanted it. I was trying to find out what was in his matrix and trying to put myself in his shoes. Now he can sit back and observe on a large screen display his force disposition anywhere in his AOR and see what Soviet ships are present and their relationship to our ships. The day that the Yankee sub went down, I sat there and smoked my pipe and watched the entire thing unfold. I saw all the Soviet ships close in and rendezvous at datum. I observed one of our MSC (Military Sealift Command) ships north of where the Yankee submarine was located. I was able to call him up on MARISAT (the Maritime Satellite communication system) and tell him to go to the area and pick up any survivors.

I had once walked into the command center and said, "I want to talk to our ships at sea," because USS *Kidd* was coming into a storm that we were following. I wanted to talk to USS *Kidd*. The command duty officer said, "We'll call NAVCAMS-LANT and request a satellite channel." I said, "Read my lips." The only reason NAVCAMS-LANT exists is for the Commander, CINCLANT-FLT. I was his deputy. I should not have to call up and ask a communicator for permission to get on a satellite to talk to my ships. We soon had a SAT-COM capability in the command center. And instead of phone watchers and people worrying about press releases, we had a command duty officer who could make a command decision on behalf of the CINC.

Command, that's very important. He had a system from which he could command. Call up the *Kidd*. Leave it to the discretion of the commanding officer. "You have a storm, the seas are building," and so on. "I recommend...." or, "Do you have that weather forecast?" As a matter of fact, one of the fallouts of our C^3 system was that we saved many lives at sea. We started saving more lives than the Coast Guard, because we had accurate positional data and real-time communications. We knew what the weather was, real time, and it was *relationable* to our ships at sea. If you gave me a lat/long of a sailboat that was not in our system, we just put a penlight on the screen and we knew where our ships were relative to it, and we'd call them up and say, "Okay, *Belknap*, you've got a motor vessel in trouble, sinking, bearing so-and-so." As a result, we saved lives.

It was the same way with drug running. We put a JOTS terminal in a hotel in Miami Beach, at the 7th Coast Guard District Headquarters. The commodore could then see where his and our ships were. He would put a law enforcement element on one of our Navy ships closest to the suspected drug runner. The confiscation rate went up overnight. It's a simple command and control system. They have a systemic problem because they have three organizations running the drug interdiction effort. The Coast Guard wants to catch them at sea. Customs wants to catch them as they come across the beach, and the Drug Enforcement Agency wants to catch them in a smoke-filled room, and no one is in charge of the C^3 system. We give them a C^3 system which they could utilize, and although it has increased their effectiveness, the command element is still missing.

Oettinger: Could you address this presence? For instance, it's fine, keeping ships from being sunk. Can you figure out instances where the presence was less than welcome? A lot of this depends on whether the presence is coming down or upward or what.

Tuttle: Let me give you one positive side that drove me to this and then the negative side when a senior became irate until I educated him and now he's one of the system's biggest proponents.

We had an amphibious group depart the East Coast of the United States, and about five days later we happened to receive a message that reported storm damage that had occurred five days before. The bosses didn't even know about it. We had tracked them, but we didn't track them in relation to the weather. The bosses had received the daily brief, including the weather, and observed the amphibs across the Atlantic, but at that time the weather information and the positional data were not fused together. If our C^3 system had been up at this time the damage would likely have been avoided.

One of the first C^3I systems we put together was in USS *Forrestal*. A good friend of mine was the battle group commander. We arranged for him to have two broadcasts. The OTCIX broadcast would go from ship to ship, and ship to shore, and we ashore used TADIL B (Tactical Digital Information Link) to go from shore to shore, and shore to ship. We only sent that information that the other one

didn't have, i.e., Delta broadcast. By doing so we cut down on our communications requirements.

Another source for locational data is the force high-level terminal which came out of this so-called WWMCCS database. Ships are required to report their position every four hours. I observed two formations, one 96 miles behind the other. Then I realized what the source of data was, and we cleaned up the database. All good sailors make a report and stay four hours ahead of Position of Intended Movement.

We found out why there was a four-hour delay in position reports. The reporting system was set up in 1982. When they started this reporting system they pumped these reports out dutifully. They file these reports every four hours. It goes into this Honeywell, and it just resides there. But in 1982 the report was created for a machine — slant, slant, so many spaces; slant, slant, so many spaces. You had to spell out "Secret" or "Confidential" every time, etc. We became slaves to a system that no one used. But they had so many error rejections that they had 15 people on CINCLANTFLT staff who did nothing but make corrections. They had so many rejections at first that they only picked up the ones it rejected every four hours. The procedures became chiseled in concrete. It became one of the Ten Commandments, and they only picked the reports up every four hours.

I challenged the database and found Texaco tankers going by Omaha, Nebraska, and these tracks had been in the system since 1982. That same database was being drawn upon in the National Military Command Center by very intelligent 0-4 or 0-5 level Air Force, Army, or Navy officers. Every morning at seven o'clock and every evening at seven, these officers would get a page printout of all ship locators and put it up on top of the terminal. Why? Because that's what was in the turnover logs. Who looked at it? No one. But Admiral Crowe has to know right away where his ships are.

Croke: How optimistic are you about the future of the Special Operations Command? Do you see a need for it?

Tuttle: I wouldn't touch that with a ten-foot pole. First of all, the capability is certainly needed. The capability of special operating forces has been there ever since Geronimo or before. The command relationships and organization have been established, and now I need to put together a C^3 system to support it.

It's very difficult for most Americans to be dishonest and we as a people are humane. We look at life differently from some other nationalities. We do need some people who know how to fight fanatics, and understand the fanatical mind. They all accuse us, in the political world, of liking to impose our values on others. We love to be loved; and so you do need people who are snake eaters, who will slit a throat if need be. That can be taken as crude, but it's the realities of life. We call them strange, but they're very patriotic people.

The Special Operations Command has some unique communications requirements that I've got to satisfy. One of them is low probability of detection.

Student: As a problem, you mentioned the flow of messages on terrorism, and that only .1 percent were effectively read.

Tuttle: By someone who was in a position to make any meaningful decision. That was the situation in 1981. I imagine that significant progress has been made since, because of increased emphasis.

Student: I can see how easy it can be, technically, today, when it comes to cartography and real-time positioning of the ships, and positional satellites, but the communication of written messages is a whole different problem. How do you address this, and is artificial intelligence a part of it?

Tuttle: Are you in artificial intelligence or expert systems? As a matter of fact, in 1981, they had a computer program called Trap Target. They were doing just this sort of thing on terrorism, and they called it link analysis. It was a very low-order, almost mundane system in which they took an event, or a person, or a weapon such as a nine millimeter pistol, and linked known intelligence together in order to predict an event. They put this program in a very archaic system; in fact, they had difficulty finding the people to input the data. Nevertheless, it was an early system that took available data, primarily messages, and laboriously attempted to determine what terrorist groups were going to target. Now we use optical scanners to sort out messages by keyword detection for automatic distribution. Many messages today are machine readable.

If you can predict an event, then you can start looking for the time of the event and determine how you're going to disturb or prevent it from occurring. In fact, right now if I had the money to put the analytical tools together, I would build an ASW (antisubmarine warfare) model that, while I'm home at night having a martini, is telling me where the Soviet submarines are, what their target aspect angles are, what their depths are, and how noisy they are, and it can all be done. Right now it can be done

off-line, laboriously, from all of the fixed arrays, including towed arrays. I want the system to tell me, from available inventory of ASW resources, which ones to employ. A model could do this right now, in near-real time. With infrared satellites, you can tell from surface pictures the location of ocean fronts and eddies and temperature discontinuities. You know what the salinity is with a great degree of confidence. You know what the sound velocity profiles are. You can determine the figure of merit for a SOSUS (Secure Ocean Surveilliance Under Sea) array, much as you can the gain of antenna, but for a given frequency and a given dB or noise of a submarine. The model I envision would be three-dimensional and appear like a lava lamp. I could then see where the holes are in ASW coverage.

McLaughlin: We are out of time. We'd like to thank Admiral Tuttle for coming today.