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**Networks, Information Technology,
and Paved Cowpaths
Dale W. Meyerrose**

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Networks, Information Technology, and Paved Cowpaths

Dale W. Meyerrose

March 16, 2000

Brigadier General Dale W. Meyerrose, USAF, is the director of communications and information, Headquarters Air Combat Command, Langley Air Force Base, Virginia. In this capacity he is the functional leader for 15,000 communications and information professionals providing services to 101,500 active-duty members of the U.S. Air Force and civilian personnel at 30 major installations in the United States, Panama, Iceland, and Portugal. Additionally, he directs the activities of 40 Reserve communications units upon activation. General Meyerrose develops policy, oversees programs, and manages resources in supporting the command's mission to provide nuclear forces for U.S. Strategic command, theater air forces for U.S. Atlantic Command, U.S. Central Command, U.S. Southern Command, U.S. European Command, and U.S. Pacific Command, as well as defense forces for the North American Aerospace Defense Command. He entered the Air Force in 1975 and has spent most of his career in communications assignments, highlighted by service as a joint task force director of communications, as a joint communications support officer, and as commander of two major communications units. Prior to assuming his current position he served as the director of communications and information at Headquarters U.S. Air Forces in Europe. The general wears the master communications badge and also is a master parachutist. He received a B.S. in economics from the U.S. Air Force Academy, is a distinguished graduate of the Squadron Officer School, received an M.B.A. degree from the University of Utah in 1978, and attended the National War College.

Oettinger: I will not give a lengthy introduction of General Meyerrose. You've all read his biography. I just want to say how delighted we are to have him with us. You'll notice that "deviations are authorized, questions will be welcomed, and dissenting opinions savored." So do us proud and interrupt and ask questions as we go on. Sir, it's all yours.

Meyerrose: Thank you, sir. I am used to speaking to a lot of different audiences, and so it does not bother me that folks maybe come with different backgrounds. So I'll try and establish a few frames of reference (**Figure 1**). Most of the slides are self-explanatory.

I thought I would divide the time that I have into four blocks. That means that I couldn't decide what to talk to you about. I'll make them four quick, succinct blocks, and they're things that I hope you find thought provoking. Then, after that, we'll truly make it a free-for-all.

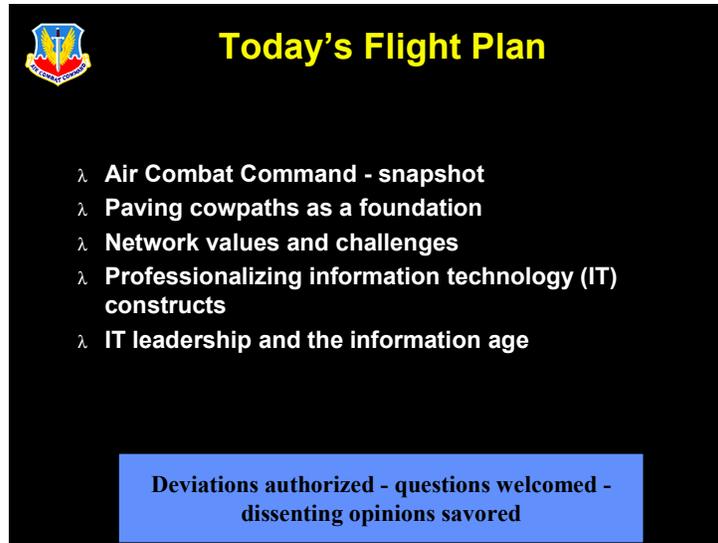


Figure 1

Before we really get started, I want to give you a frame of reference about what I do on a routine basis. I'm in Air Combat Command [ACC] (Figure 2), which is headquartered at Langley Air Force Base, down in the Norfolk region in the southeast corner of Virginia. It's a beautiful place, especially at this time of year. The azaleas and dogwoods and tulip trees are out, and it's absolutely gorgeous. I wish I were there.

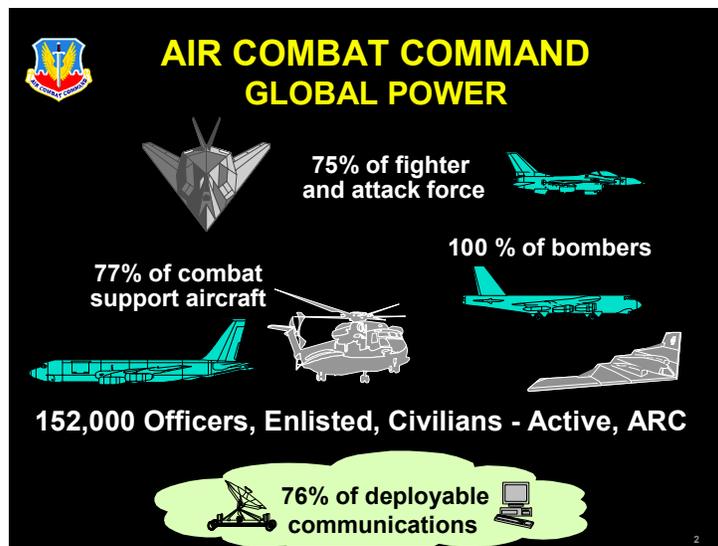


Figure 2

Air Combat Command is the single force provider in the U.S. Air Force. A force provider is the entity responsible for the organized training and equipping of combat forces, which we then turn over to commanders-in-chief. For instance, in the recent Kosovo operation, the commander-in-chief in charge of that was the commander-in-chief of U.S. forces in Europe. He utilized many of his forces in Europe, but most of them were forces that came from my command, went over to

Europe, and came up underneath his command. That goes along with the change in military strategy that we've had since the end of the cold war, which predominantly makes the U.S. military a home-based force. We then take expeditionary type means to go out and respond to national priorities.

You can see the numbers there. ARC stands for Air Reserve Component. (If there are any acronyms you see that you don't understand, say something.) That also includes the Air National Guard and the Air Force Reserve. As you can see, that's a fairly hefty force. It is roughly 34 percent of the total Air Force population, and the preponderance of Air Force firepower.

If you were to look around the continental United States, this is where you would find those forces (**Figure 3**). The places in white are bases that my command owns. The places in yellow are where we are hosted on another command's installation. We no longer have forces stationed in Panama; however, we are responsible for several counterdrug-supporting elements there. Lajes, Azores, of course, is halfway out in the Atlantic, not where I have it on the slide. Keflavik, Iceland, is part of the NATO [North Atlantic Treaty Organization] commitment. The other thing I didn't show here is that all of the Air Force forces stationed in southwest Asia are considered ACC forces because they're not permanent.

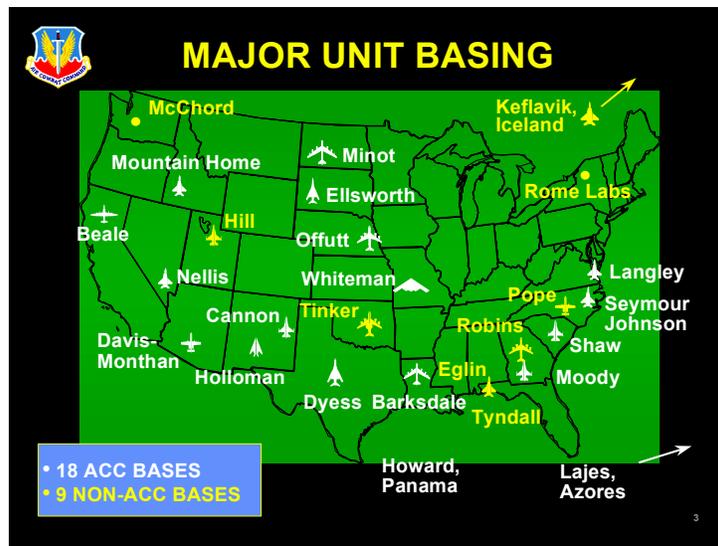


Figure 3

Of those 152,000 folks, 20,000 are communicators whom I take care of. They're not under my direct command, but they're under what we call my functional command, which means that I establish what their training requirements are, how they do their jobs, how they are evaluated, how many it would take to do a certain job, and what technical requirements they've got to have. I'm also the one who builds the communications and computer infrastructure.

That gives you a feel for Air Combat Command, where I come from. That's all I'll say on that unless you want to revisit it later.

I would like to leave an underlying thought with you: We all have access to the same basic information. How we view these data points and what we do with them is what counts. For the most part, I will probably not say anything you have not heard or don't intuitively already know,

but I hope I will provide you with a new perspective about those data points that you already know. Most learning takes place at your age. In my view, most learning comes from a deeper understanding of what we already know.

The historical perspective I use (and I'll go through some other historical perspectives here) is that any time you conduct an operation, whether it's a military or a corporate operation, it is important that the experience teaches the right lessons and leads to the right corporate retention. Let me give you an example. Most historians pretty much agree that World War I was largely a trench warfare type of operation. You can make some cases on the periphery for certain other types of warfare, but, by and large, it was trench warfare. All the militaries of the world took away those data points from World War I. What did they do with them? With some overstatement, but a great deal of truth, the French went about perfecting the trench, so much so that the Maginot Line became a very famous symbol. The Germans went about making the trench irrelevant with their Blitzkrieg maneuver warfare. So, in June 1940, when we pitted the perfect trench against the force that made the trench irrelevant, it only took the Germans four days to overrun France.

Did the Germans or the French have different starting points? I don't think so. Did they have different data points? By and large, probably not. But what did they do with those data points?

I'm now going to talk about paradigms a little bit, and I'm going to talk about them in a way that I hope you'll remember. This is East Grinstead, England (**Figure 4**). I'm probably the only person in the room who's been in East Grinstead. This little village was founded in the ninth century. In the ninth, tenth, and eleventh centuries it was an overnight stop for travelers from London to the southeastern coast, to Dover. By the end of the eighteenth century, as transportation improved and got faster, it was the noon stop on an all-day trip from London to the southeast coast of England. Basically, we have what amounts to a stopping place. The Domesday Book, drawn up under King William I, talks about East Grinstead in terms of twelve settlements, probably twelve families. The first example of what we would call a restaurant-hotel in today's vernacular—a place for people to stop—appeared around the thirteenth century as a public place, and in the fifteenth century the church was built. It's a very quaint English town, with lots of hedgerows.

I would like you to look at its transportation system. Look at the road structure. The only thing that is not a road structure is the train that comes into the station and goes right back out the same track. Outside of that, the road structure is essentially as it was laid out by cows in the ninth century, because that was the quickest way to get the cows out to pasture and to bring them in at night. Over time, the dirt paths gave way to cobblestones, the cobblestones gave way to gravel, gravel gave way to concrete, and concrete gave way to asphalt. But notice that the basic structure is virtually unchanged. With the exception of the library, the art center, and the hospital, most of the major structures in downtown East Grinstead have been unchanged for the last 300 years. I call this phenomenon “paving cowpaths,” and I'll draw some analogies here in the modern world of how we pave cowpaths today.

Interstate 10 was planned in 1957. Construction started in 1961 and, lo and behold, it is still unchanged from the original layout that we determined were the important elements when we outlined this transportation system. It's interesting how towns develop. The determinants are not necessarily cultural, because I could go to almost any one of your countries, or virtually any country I've been to in Europe, and find the same kinds of parallels.



Figure 6

So, why do we create cowpaths? We, as human beings, like familiar routes. Sometimes change bothers us; as a matter of fact, change often bothers us if it comes in large amounts. Therefore, we tend to develop certain associated habits that help add structure to our lives to mitigate the forces of change. We pave cowpaths, because once there's a path we build a structure there. To alter the cowpath means you have to alter the structure you build there. The easiest way to think about this is a bridge over a body of water. If you change the cowpath, you have to change the location of the bridge.

Think about it in somewhat more modern times. Where do the utilities run? Where do the sewers run? Where does the electricity run? Where do the communication lines run? These cowpaths represent our common interest. Going back to my element of change, cowpaths often represent the path of least resistance.

There's also the lack of vision. Do you think that anybody in the ninth century could have foreseen twentieth-century transportation? They could not. Could anybody in Wichita in 1869 foresee twentieth-century transportation? Perhaps they were a little closer, but probably not to the fullest extent. Then look at the Los Angeles intersection I showed you. Could they foresee it? Yes, in fact, that was set up for high-volume traffic, moving folks from north to south and from west to east, and these are our cowpaths.

In East Grinstead, do you think anyone is going to tear down the church that was built in the sixteenth century? That is the character of that town. That represents something so near and dear to the inhabitants of that town that they would never give it up. So, East Grinstead is forever

doomed to be a quaint little English town, with windy roads and without great commercial development.

Now I'm going to try and bridge that into some things that, hopefully, you'll find a little bit more relevant to why I am here. It doesn't matter what the words are, but what does this look like (**Figure 7**)? One standard, government-issue form, right? It is, in fact, Department of Defense Form 1351-2. A 1351-2 is what we have to file in order to get repaid when we go on travel. It has been around since the Army issued it to the Air Force in 1947. Notice that it is in a nice computer format. It even has the kinds of things that you would expect, the look and feel of Windows. I'm sure the other services are much more efficient than we are, but regardless of the cost of this travel (I could be filing a travel voucher that gets me no money), it costs the U.S. Air Force \$25.16 to process the paper copy of this form.

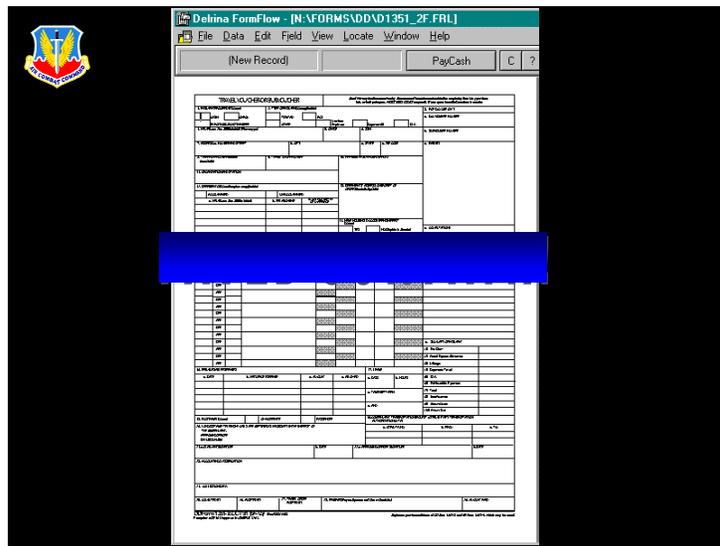


Figure 7

We automated it. It looks the same and has the exact same feel. How much do you think it costs us to process the automated form?

Student: Twenty-five dollars and 15 cents.

Meyerrose: Fifteen and a half percent more than the unautomated form. Why? Because we paved a cowpath. We did not leverage information technology to make this process quicker and easier. We automated a form, which made it more manpower intensive.

I believe that we tend to do this a lot. Why? I've already given you the reasons why. Because every person in the U.S. Air Force, the U.S. Army, and the U.S. Navy knows what this is. It's familiar. They're not put off by it. They know that there's a means or mode of transportation, the place visited, the reason, the time arrived, and all these others. They know all that stuff.

Student: It's part of their culture. You don't have to turn the form over to look up the abbreviations. They're memorized.

Meyerrose: But, what did we do? We paved a cowpath. In fact, what if we had it look like this, where each of the fields related to a correlational database, with an automated audit trail, with an electronic key into the appropriate accounts (**Figure 8**)? If we had not paved that cowpath, if we had truly used information technology as we should have, the cost of processing this form would be \$1.99. We knew what we wanted to do. We just didn't quite have the right elements to think about in trying to get it accomplished.

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Federal Automated System for Travel - (tcp)
USER 4.1F          TRAVEL VOUCHER - UNTITLED
File Edit Rates Tables Reports Setup Utilities Help

SOCIAL SEC NO
- NERO, LING L.          ADVANCE OUTSTANDING 0.00
CREATED CAPT           ADVANCE TO APPLY 0.00

TRIP NO 1             AUTHORIZATION NO TF18399
PURPOSE CONFERENCE ATTENDANCE  DATE 08/05/97
                                TYPE ROUTINE

ITINERARY             EXPENSES
ACCOUNTING CLASS      TICKET INFORMATION
FV7 SCB ROUTINE

OTHER COMMENTS

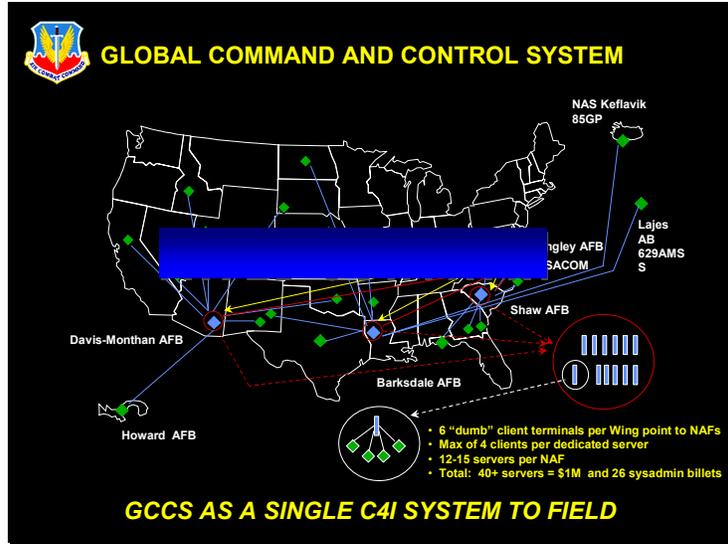
Enter the traveler's Social Security No . Press F6 for a list of travelers.
Press F5 to edit the personal information for this document.
F1-HELP F2-MENU          F6-CHOICES
```

Figure 8

Oettinger: Maybe you'll get to it, but there's a more charitable way of looking at that, isn't there? At the time you're thinking about it, all the pieces necessary to do the revolutionary thing aren't there, and so, even if you were smart as hell and inclined not to be full of habits, et cetera, you'd be kind of stuck. In retrospect, it's easy to see the pieces, but they don't ever come all ready to fit with one another at the same time.

Meyerrose: True! When I get to my third section and I talk about relating the total business process to information technology, I will address Dr. Oettinger's question about how, even if you don't have the refinement of technology that allows you to do something, you come to the rapid conclusion that it's your process that has the big savings, not your information technology. So, if you work the process, technology will improve on your process incrementally. But it's the process that represents the big cost of working most of our information technology elements. I will address the incrementalism in a little bit.

Those who are familiar with the U.S. military have heard of the Global Command and Control System [GCCS]. The GCCS was the system we created to replace the World Wide Military Command and Control System, called WWMCCS. When it came time for us to replace the system, we kept the same circuits, we kept the same everything (**Figure 9**). We just put new boxes where all the old WWMCCS boxes were. What did we do? We paved a cowpath.



AB = airbase AFB = air force base NAF = numbered air force
NAS = naval air station USACOM = U.S. Atlantic Command

Figure 9

It took us two years, led by General Edmonds, your speaker of last week, to come up with a solution that created a network mechanism (**Figure 10**). SIPRNet stands for Secure Internet Protocol Router Network, which is a U.S. government operated intranet, if you will. What spurred us to unpave that cowpath? It was the cost. Doing a one-for-one replacement of the old with the new cost more, and it became readily apparent it cost more right up front.

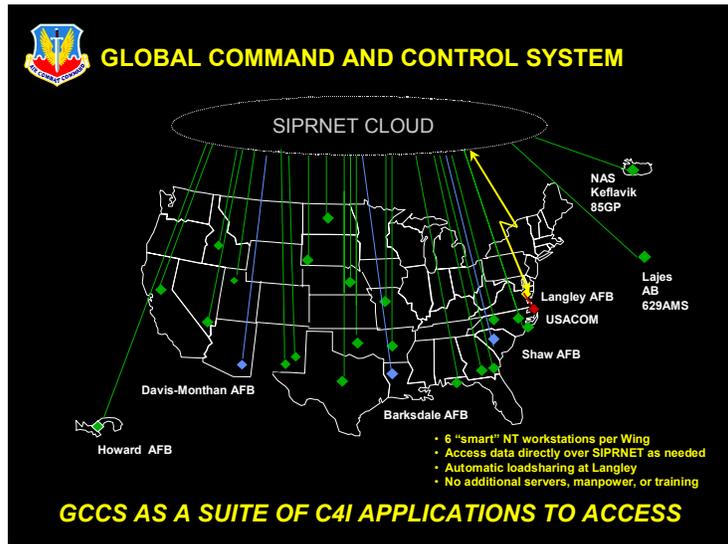
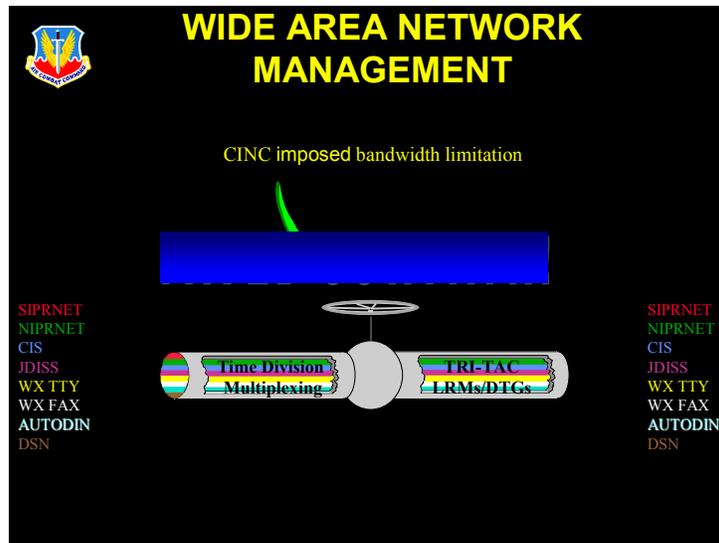


Figure 10

Think about it! We were putting a client-server system out there and then tying it together with 9.6 kilobit point-to-point circuits. With huge databases, do you know how long it took for a mouse click to go out, get refreshed from some kind of a mainframe node, and come back? Right

away we ended up with less capability than we started out with when we modernized, and that caused us to undo that cowpath and go to a network kind of solution.

This isn't a commercial (**Figure 11**). The abbreviations are immaterial; all they represent are point-to-point capacities. In essence, bandwidth, being a commodity that involves costs and that has to be partitioned out among users within a network, is a paved cowpath when you leave it in a point-to-point configuration with today's technology. In fact, what you need is something that allows you to partition the bandwidth according to the requirements of your organization (**Figure 12**). If you're a banking organization, it's how you do batch processing and updates of client files, et cetera. If you run military operations, it's the apportionment to the command and control assets that control your forces versus the apportionment to the combat support elements for your forces. It's in constant need of adjustment. In the network vernacular, if you pave a cowpath in a point-to-point fashion, then in fact what you end up doing is buying more and more point-to-point configurations and having a larger and larger percentage of your available bandwidth go unused.

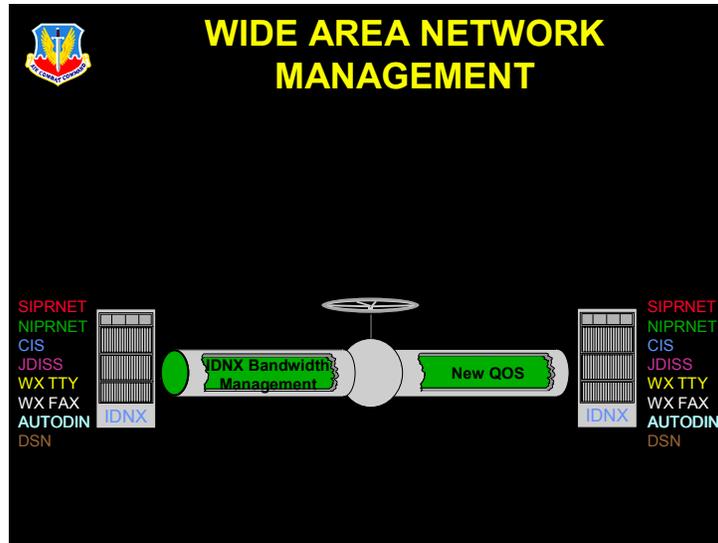


AUTODIN = automated digital information network CIS = computer and information services DSN = Defense Switched Network DTGs = direct trunk groups JDISS = Joint Defense Intelligence Support System LRMS = Location Records Management System TRI-TAC = Triservice Tactical Network TTY = teletype WX = wide area exchange

Figure 11

Many of us have heard about electronic recordkeeping (**Figure 13**). It's this business of, "We're going to transition from a paper environment to a paperless environment," right? Guess what we're doing? For the most part we're paving a cowpath!

The debates that I end up getting into within the U.S. government are: Do you store that as a file? Do you store that as packets? Do you store that as dependent upon an application, where you have to store the version of the application along with the data so that you can verify that the data have not been altered at a later date? All are elements of paving cowpaths, in my view.



IDNX = integrated digital network exchange QOS = quality of service

Figure 12

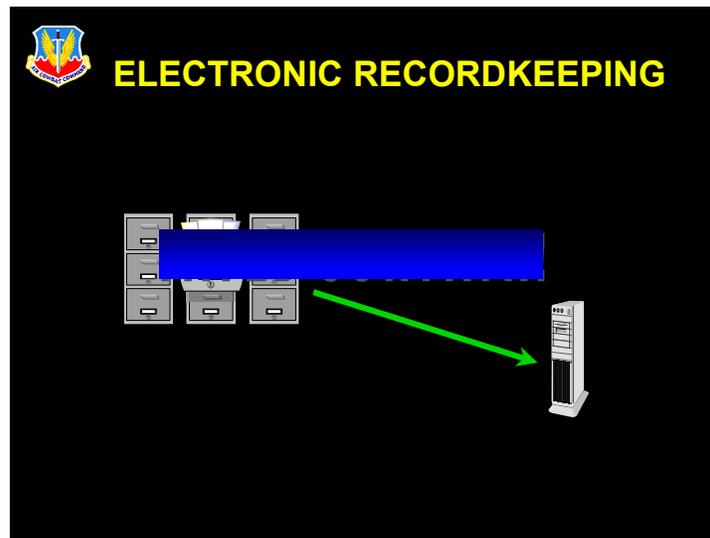


Figure 13

I'll get off this cowpath kick directly with the idea of cloverleaves (**Figure 14**), but remember my cowpaths. The elements of cloverleaves became an enabling technology as we went along in the idea of transportation. Cloverleaves allowed the transportation system to create a capability incrementally that earlier it didn't know it needed. This gets back to what Dr. Oettinger was talking about. Does the cloverleaf represent an undoing of cowpaths or an undoing of an infrastructure? No. It represents an enabling technology. It's an innovation that underpins the incremental improvement of what you've already started.

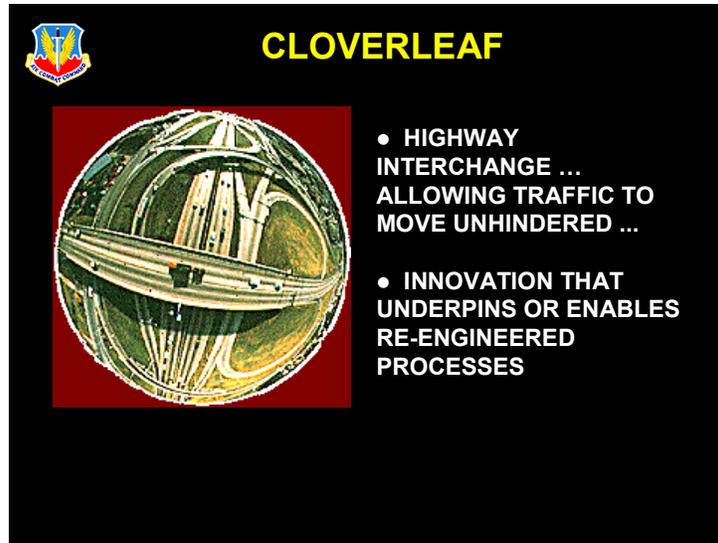


Figure 14

Here are the underlying things I'd like you to think about in this first section of this presentation (Figure 15).

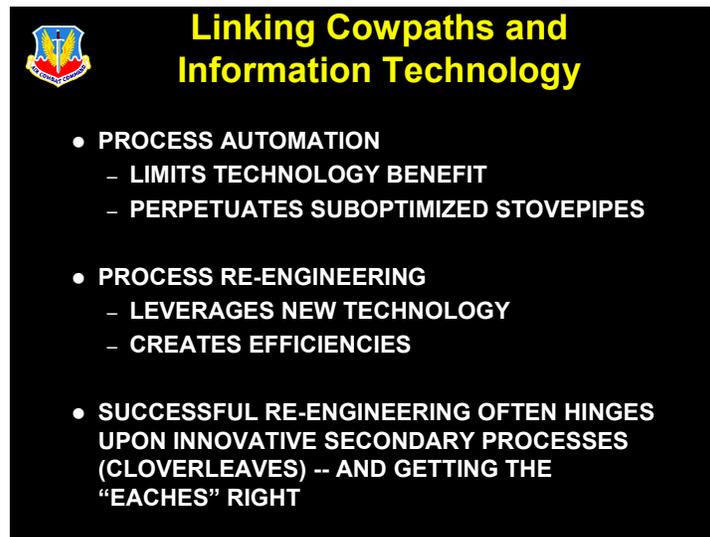


Figure 15

I'm ready to go on to Section Two: Information Age Values. The question is: Do the values of the industrial age and the jet age still have the same importance in the information age? I maintain that they do not, and Adam Smith may be turning over in his grave because of some of what I'm about to say.

The first statement I would ask you to think about in a broader context is that everything is a node on the net, and that the value of something is marginal if it is not connected (**Figure 16**). Every time I start an airplane, it becomes a node on the net. It requires information, it consumes information, and it provides information. Every time I start a tank, every time I send out a platoon, every time I start a ship, every time I put an independent user out there connected with a wireless capability back to my network, everything is a node on the net.

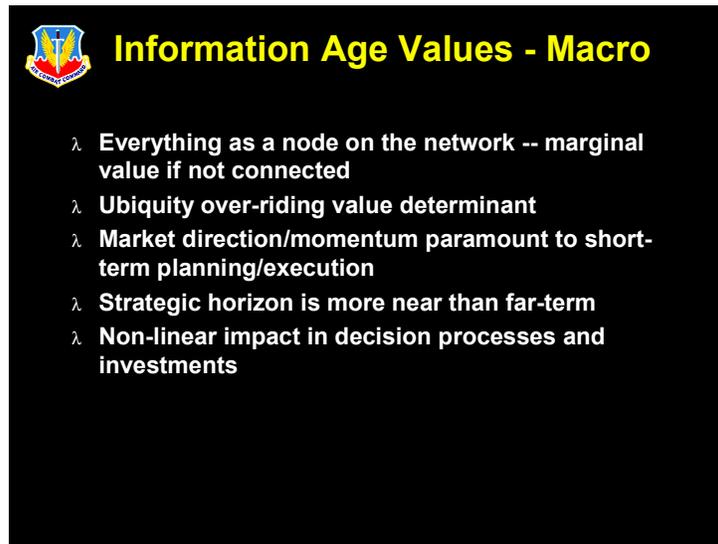


Figure 16

George Gilder is a technologist.¹ He would agree with much of this. In fact, some of the realizations came to me from talking with him and reading some of his material. He points out that in the West horse troughs are nodes on a net. There are chips in them that signal when the water is gone so the rancher can go out and refill the troughs. There are sensors on gates that tell you the gate's open and remind you to go back out and close the gate so the horses or cattle or sheep or whatever don't get out. How many years ago would we have thought it completely unfathomable that every door in a hotel would be a computer connected to the net? Something as inanimate as a door!

As a matter of fact, I believe in the future that our clothing will be network smart. You will probably have clothing that will sense your body temperature and change how it absorbs or doesn't absorb heat based upon outside stimuli. We already have elements of this in our fighter cockpits. G-suits are nothing more than the precursor to having smart clothes, if you will.

¹George F. Gilder's most recent book is *Technocosm: How Infinite Bandwidth Will Revolutionize Our World* (New York: Free Press, 2000).

I think Netscape is probably one of the most relevant examples of ubiquity. Let's imagine forming a company. We have a single product, and we give away the first forty million copies and we make a profit. Kind of amazing, isn't it? How is Microsoft's worth measured? It is measured by its universal application. By contrast, in the jet age and the industrial age, scarcity was the driver of value.

In my business, figuring out what the mainstream market is doing has more impact than what my requirements are. In reality, most of us in a rapidly changing environment have to back what we do into what the doable and available are.

The strategic horizon is more near term than far term. I would submit, depending on what business you're in, that the strategic horizon may be only five years away or less. I think it is sometimes that way for political processes as well.

Oettinger: From what I've experienced over the last few months and from the way the stock market has been going, I would argue that today for the business world the horizon is tomorrow's opening. That's about what has happened to the planning horizon.

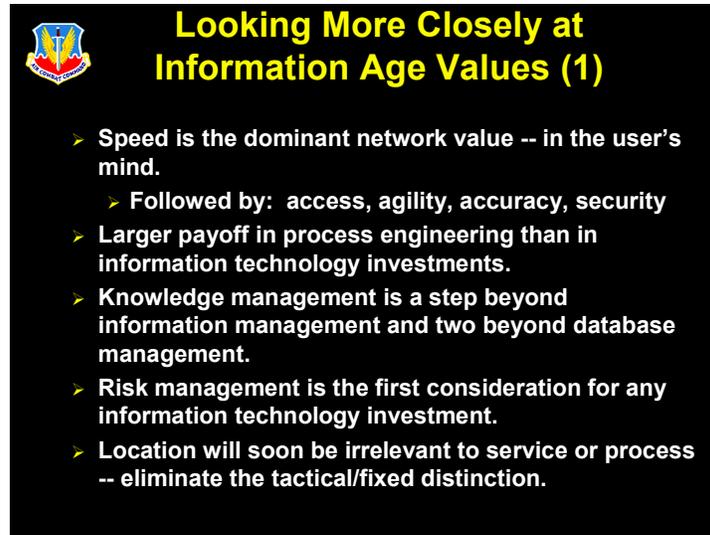
Meyerrose: Yes, it is. Is that all bad? How agile and adaptable are you to change? How much in the mainstream are you in your values and your investments? If you're on the margin, then you risk going broke or, in my business, you risk mission failure.

Fifth and finally, I think that we're clearly in the business of nonlinear impact in decision processes and investments. I don't think I have to explain that much. When we built up the industrial giants of our world in the late nineteenth and early twentieth centuries, the payback from large plant investments, where you spent hundreds of millions of dollars on plants, transportation, commodities, and all those kinds of things, was in proportion to what they cost. Think about it now. If you don't pay \$19.95 for virus software protection, it cripples your entire multimillion-dollar corporation.

That's kind of at the macro level. Let me drop you into some of the areas that may later stimulate a whole bunch of questions and look more closely at information age values. This is an area I work in a lot (**Figure 17**). The first point bothers a lot of communicators, intel officers, and security people. It's not necessarily how I make my recommendations, but I believe that it is how the people whom I serve and the people in business view the world.

I'll spend a little bit more time on process engineering in the third section of my presentation. I'd like you to look at the middle point. What we lack in a lot of our information business or our knowledge business are good, concise definitions. If I were to say the words "airplane strut," there's probably nobody in this room who doesn't know what an airplane strut is. In 1924, how universal was that term? Probably not very. In 1999–2000, we have the vocabulary, but we don't necessarily all mean the same thing when we use the same words: information operations, information assurance, information warfare, information in warfare...all kinds of things. While we may have certain common elements, our precision is lacking and, therefore, our ability to address some of these problems concisely is severely affected.

Risk management is not something one normally associates with information technology investments, but it is the first consideration for any such investment. The last point sometimes bothers the people who wear military uniforms, because, in fact, we have a cottage industry around the tactical business because those are the warfighters. I think being tactical or fixed,



Looking More Closely at Information Age Values (1)

- Speed is the dominant network value -- in the user's mind.
 - Followed by: access, agility, accuracy, security
- Larger payoff in process engineering than in information technology investments.
- Knowledge management is a step beyond information management and two beyond database management.
- Risk management is the first consideration for any information technology investment.
- Location will soon be irrelevant to service or process -- eliminate the tactical/fixed distinction.

Figure 17

or whatever your particular function is—is pretty much going to be totally irrelevant in the very near future.

Student: Do you define knowledge management within the context of process improvement or as the whole cultural change in how we use and process information?

Meyerrose: I use it to mean how you combine information with decisionmaking and value assessment. That's my personal definition of knowledge management. There is no universal definition, as we said.

Student: Regarding knowledge management, would you concede that there is a cultural change occurring?

Meyerrose: Very much so. My only point here is to differentiate, in an information technology sense, among the degrees of difficulty. We are still arguing about what data dictionaries look like, and you've got to wonder why.

The first couple of points on this next slide relate directly to the business I work in (**Figure 18**). How do you leverage information technology? To some degree, some of our organizations buy computers much as we buy notepads—as a disposable commodity in which there is no long-term investment or return on your money. Yet, if you think about everything being connected—ubiquity—even the most minor user in a network has an impact on every other user in the network.

Let me make a bold declarative statement. Theoretically, this computer I'm using right here could have an impact on a carrier battle group setting sail, or an airplane taking off, or the space shuttle performing a mission. As a practical matter, it doesn't happen because of all kinds of safe stops, but, as a theoretical matter, it does.

This may bother some of you, but I do not believe that we have interoperability problems with any nation, any coalition partner, or any other service. There is no such thing as an



Looking More Closely at Information Age Values (2)

- λ Organizational information technology standards are paramount for infrastructure return on investment.
- λ “Hobby Shops,” “county options,” and “functional stovepipes” add cost, complexity, and stymie the leverage of investments.
- λ Most interoperability challenges can be summed up in business rules and application sharing.
- λ Don’t outsource functions or core competencies.
 - Do consider outsourcing services, short-term projects, and expertise that is too hard or expensive to grow and retain.

Figure 18

interoperability problem. There is a business-rule problem and a lack of universal applications, if you think about it. That’s not your experience, is it?

Student: We send in the people to work our radios for them so they can talk to us, because we need to share.

Meyerrose: But is that really necessary? Is there anybody out there who lacks the technology to connect to the network, using “the network” in a very broad context? We have business rules that say there may be a technology chip that we do not export, or that *this* has an encryption device that we do not share with other countries, or that *this* is a government-owned piece of software that we do not let somebody from outside the government have. I think we spend far too much time on trying to force the technical part of our enterprise to solve what, basically, is a human process part of our enterprise. That is my point.

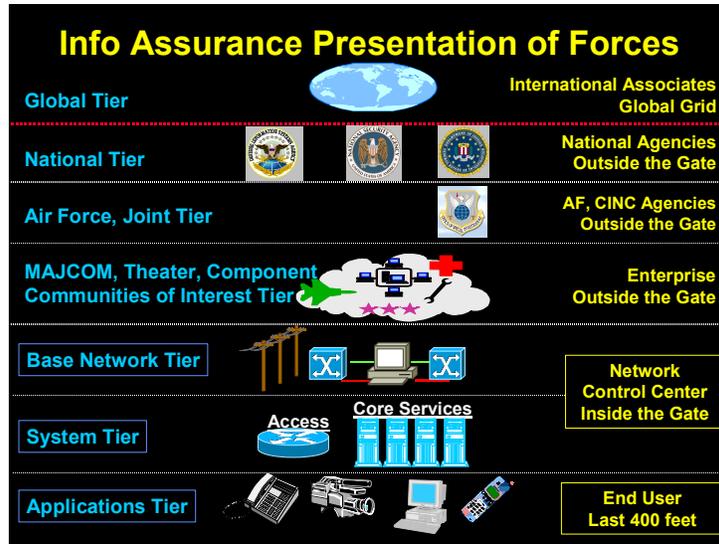
There was not one nation, no matter how rich or poor, in the Kosovo operation that could not connect to a network, could not create a Web page, did not run the latest version of Microsoft whatever, did not have a Cisco router, or did not have a force ATM [asynchronous transfer mode] switch. Every one of them did. What we lacked was a common command and control process that everybody understood and participated in, a common set of business rules as to who was allowed to share, see, and have what, and a common operating environment of applications.

You can make a phone call to virtually anywhere. You can call North Korea, right? Virtually any country can. We can make a phone call to the poorest of nations. There is a common level of technology in fundamental basic communications that pervades the entire world. In fact, you would be surprised how much of those communications we actually buy from our host country. It would astound you all.

The last point has to do with the elements of how you buy brainpower and how you cut costs. Outsourcing is a means of saying that I no longer need people doing a particular function in-house. At least in the U.S. military, that is something that we struggle with on a continual basis.

What is a core function and what is not a core function, and what can be provided by a corporation at a lower cost than we can provide ourselves?

That was the value piece. I am now going to hit a construct piece. Developing professionalized constructs (including both technology and processes) for dealing with information technology challenges is easier said than done. Again, the words literally don't matter. What matters is that there is a systematic way of setting up information technology to support the mission or purposes of your company, country, or corporate organization (**Figure 19**).



MAJCOM = major command

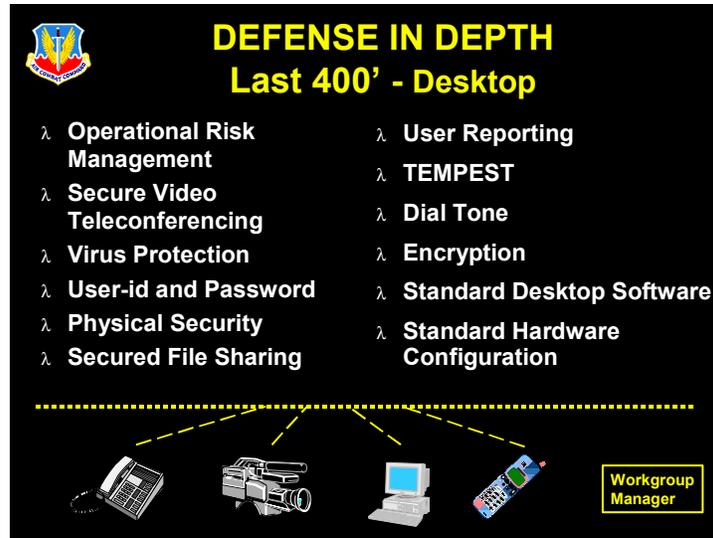
Figure 19

I call the bottom level the last 400 feet (**Figure 20**). I can give you a funny story later about how it became known as the last 400 feet. In the last 400 feet, you'll find cell phones, video cameras, and all manner of telephones, faxes, and printers. You may even find a ship or an airplane.

Buildings, facilities, tanks, platoons, whatever, usually connect to a systems tier of some kind that provides the fundamental components of switching and computing, a transmission backbone, and a security method of some kind. Even if you don't have any encryption, the way in which you set something up either has inherent security or lacks it.

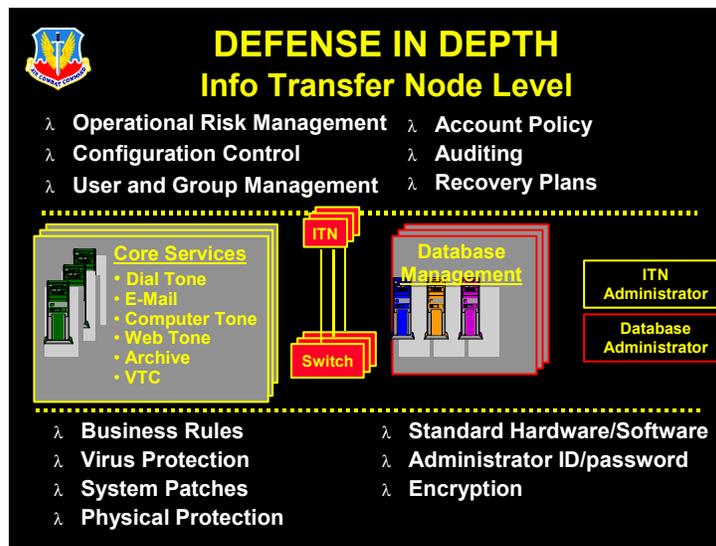
The next slide shows what's "inside the gate" when you talk about an Air Force installation (**Figure 21**). We have a function that is responsible for orchestrating all information technology processes inside a gate. The network control center ends up being the next level up (**Figure 22**). The rollup of the bases becomes a network enterprise (**Figure 23**). For now, that's associated with each of the eight Air Force major commands [MAJCOMs] (**Figure 24**). That is an organizational artificiality. Does it have to be that way? No. In fact, one of the other Air Force MAJCOMs is a part of my ACC network, so there are really only seven enterprises. But then you've got to add two more enterprises for the cats and dogs out there that don't come up through major air commands.

The point is that certain things are scalable, certain things are exportable, and others are not exportable. How much you do centrally versus decentrally in leveraging your information technology is a very important point to think about. That's all this is intended to demonstrate.



TEMPEST = Transient Electromagnetic Pulse Emanation Standard

Figure 20



ITN = information transfer node VTC = video teleconferencing

Figure 21

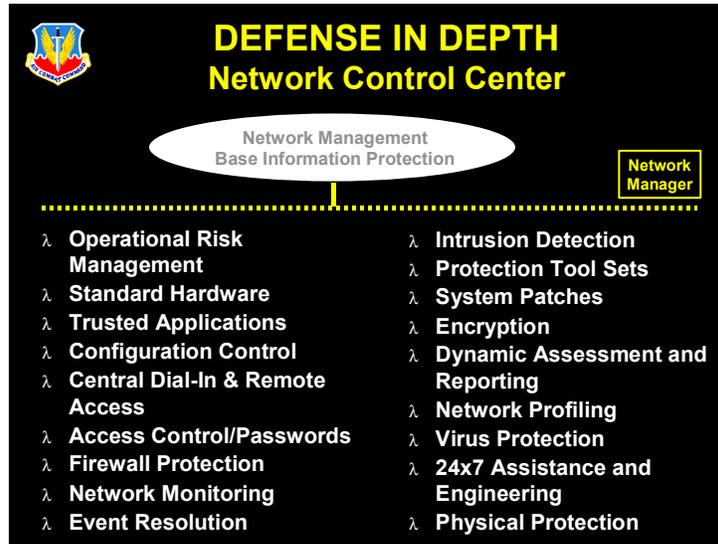
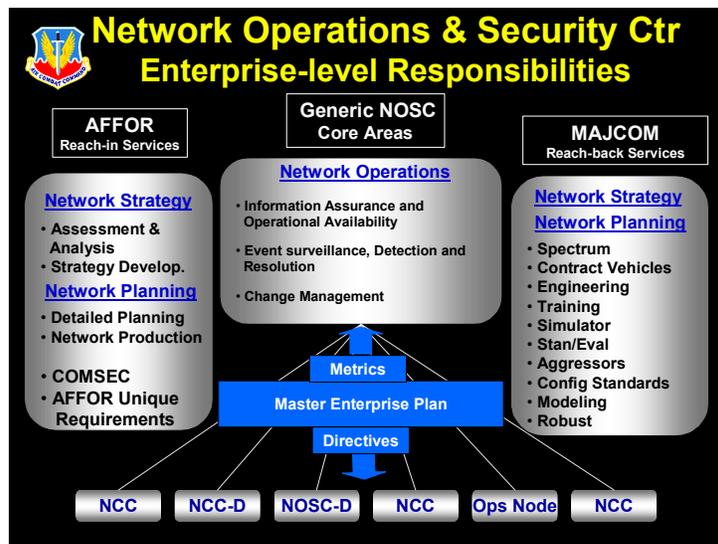
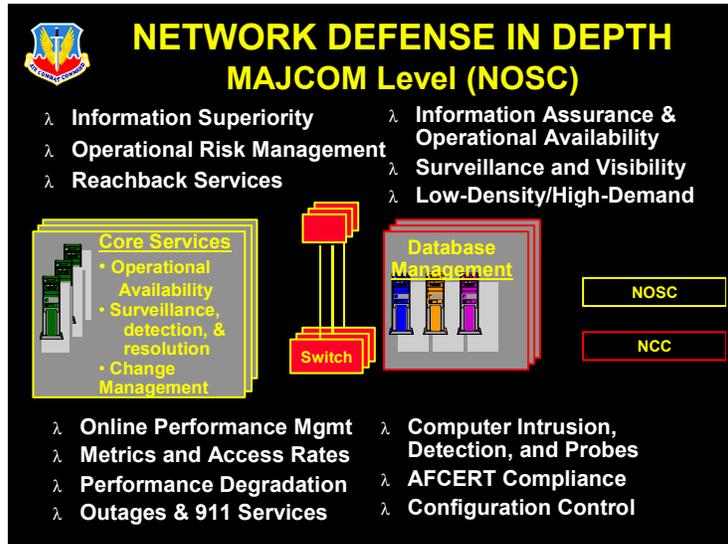


Figure 22



AFFOR = Air Force forces COMSEC = communications security
 NCC = network control center NOSC = network operations and security center

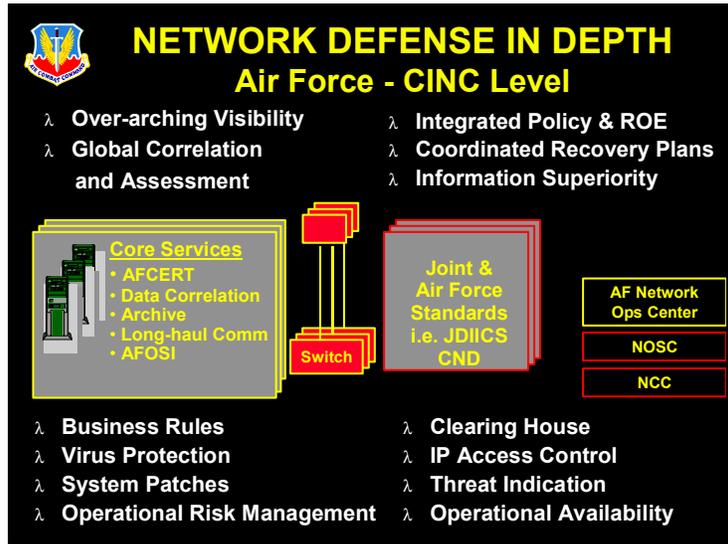
Figure 23



AFCERT = Air Force computer emergency response team

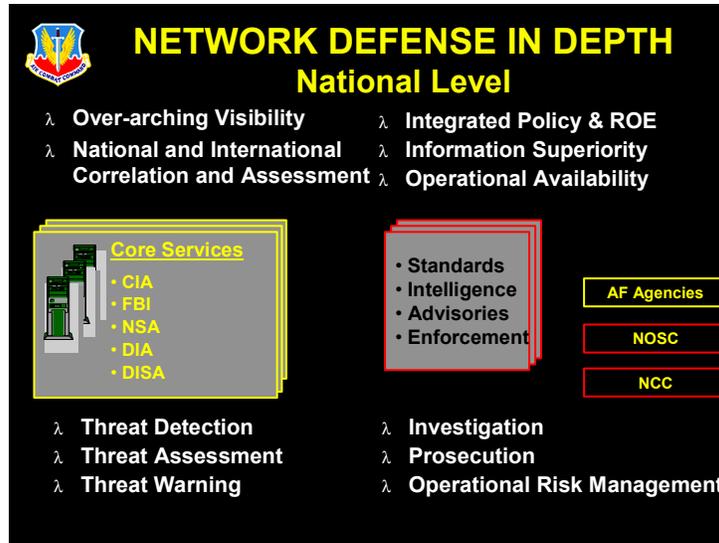
Figure 24

Above my major air command is a service (Figure 25). It could be a joint tier. Above that is a national tier of the United States (Figure 26). Its function is providing certain services, a certain kind of construct, and certain kinds of things that allow those elements below it to operate in concert.



AFOSI = Air Force Office of Special Investigations CND = computer network defense IP = information processing JDIICS = Joint Defense Information Infrastructure Control System ROE = rules of engagement

Figure 25



CIA = Central Intelligence Agency DIA = Defense Intelligence Agency
DISA = Defense Information Systems Agency FBI = Federal Bureau of Investigation NSA = National Security Agency

Figure 26

For instance, in the last 400 feet, these are the kinds things that we have in our taxonomy (**Figure 20**). Again, the words aren't important other than that you can see that we have a taxonomy that says that in the last 400 feet, in the user domain, where we find these machines or certain elements, they roll up into a common interest. It could be the intel unit at a base; it could be the commissary or the logistics. It could be all kinds of things that are a set of core services that run applications for getting that function done and that go up to a node at a location (**Figure 21**). You might call this a campus. In corporate America, they often talk about the campus network. That's what this would be akin to.

These are the things that occur at my level (**Figure 24**). The business of running the enterprise is the central part of this. Don't worry about any of the acronyms. If you're curious about them I can tell you later. But they represent nodes, bases, and other functions that are underneath the enterprise. My enterprise has 120,000 folks. I'm one of the largest exchange networks in the world.

This is what would happen at my service component level or at a joint level (**Figure 25**). Again, some things are scalable. Where do you manage passwords? Where do you establish business rules? Where do you provide encryption? Those are all things that you've got to work out in a network information technology environment. This ends up being a level above that, the government level (**Figure 26**).

These are my major points to you (**Figure 27**). We have a saying that the network is a weapon system. All that means is that we've got to bring more definition to the information technology business so that we are not victims of it, so that every new software release does not hold our processes and our mission accomplishment and things like that hostage.

NETWORK DEFENSE IN DEPTH
“Take Aways”

- λ **Defense of the network “weapon system” is a must.**
 - Includes all “community of interest” networks
 - MAJCOM, services, CINCs, and federal agencies
- λ **The network includes more than just computers.**
 - Includes ALL media (voice, data, video)
- λ **Each of the seven tiers has a role in “network defense.”**
- λ **It takes all layers working together to provide information assurance and operational availability**

The BEST defense is a well run network!

Figure 27

The network is more than just computers. I do not believe there is any such thing as a computer network. The reason goes back to my network values: *everything* is connected. Finally, it takes each layer in concert to leverage information technology.

Now I want to run you through the second structure, which is the big payoff—process engineering constructs—and their second- and third-order linkages and impacts. Right up front, I’m going to talk to you about buying computers and the cost of computers. I’m going to try to convince you that the cost of the computer is irrelevant to your total cost. In fact, the cost of your computer and software is only 15 percent of the total cost of the care, feeding, accounting for, paying for, and all of this kind of stuff associated with desktop technology. I could have a company give it to me, and I wouldn’t accept it unless I could link all the elements of their giving me the machine with my other processes.

From his perspective as a casual observer, this is what Mr. Air Force Officer can see (**Figure 28**). He’s got a need, he’s got some money, he wants to buy something, and he wants to use it. That’s pretty much what we think as individual customers going to a store.

You can probably get that user to understand that there is an underlying process, and he’s going to say, “Yes, I’ve got a need, so I’ve got to tell somebody about it, and I need to pick the equipment, and I probably need to coordinate with somebody in order to buy it. So, that’s the buy, and we get to install it and operate it, and there we go.”

I will tell you that all the costs associated with that part of the process are irrelevant to the total cost of buying information technology and utilizing it, because, in fact, you have several communities here, the customer just being one, your chief information officer [CIO] being another. I’m the CIO (**Figure 29**). I’m the one in charge of setting standards, procedures, and all that for information technology. “Fin” stands for your financial business in terms of: Was the money authorized to be expended? Was it expended right? Did you account for it right? Was the right decision made? Then there’s the business about contracting (“Con” in the slide), because that’s an element of how we acquire this type of commodity.

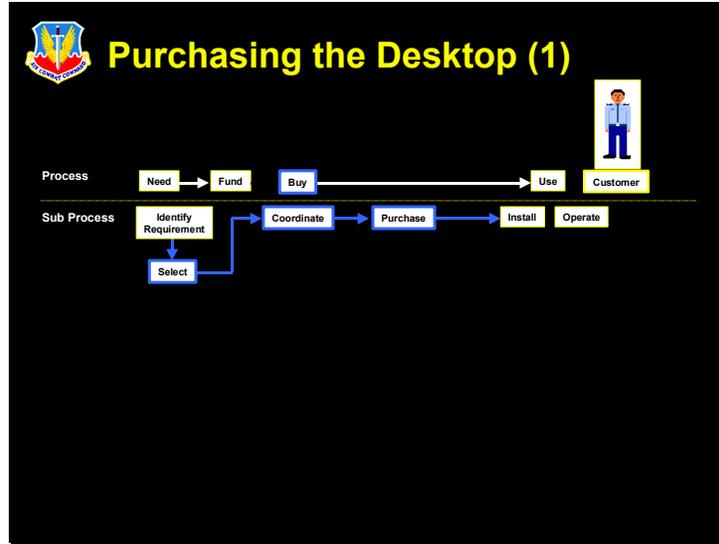


Figure 28

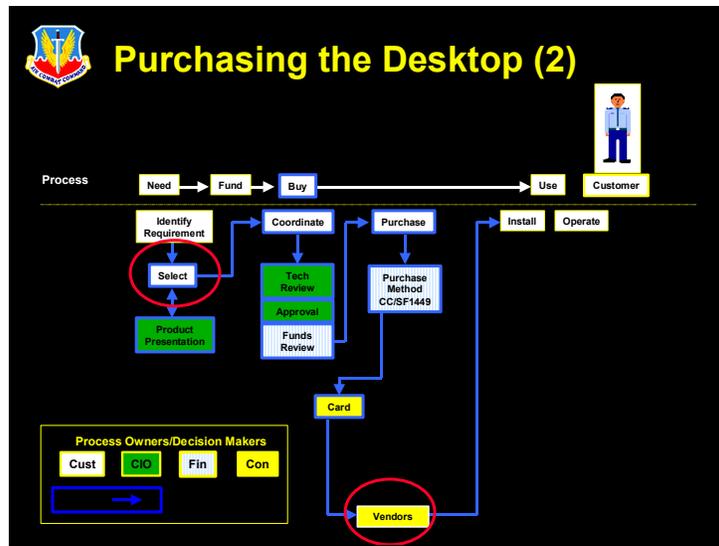
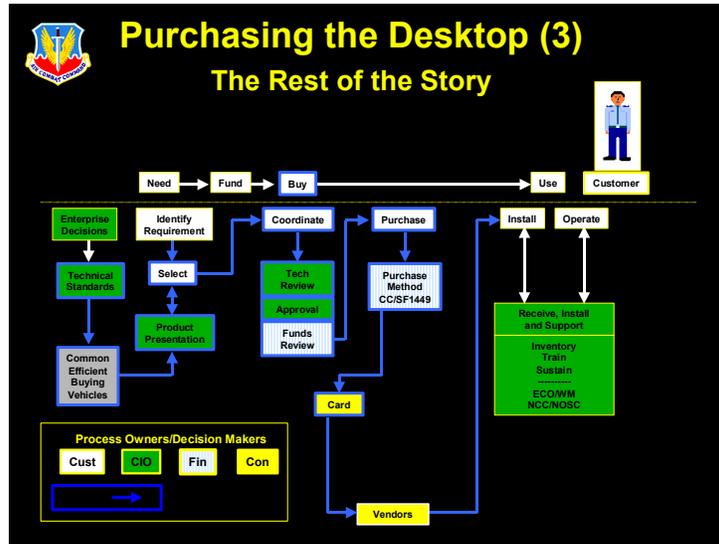


Figure 29

Again, I can probably get the user to understand these two subsets. But let me show you some more parts of the process (Figure 30). Guess what? If everything's connected, if there's value in ubiquity, if some of the values that I laid out in the value-centric business or the values of network-centric information technology are correct, then all of these other things take place. The only thing that's important is to watch the colors; don't read the words.

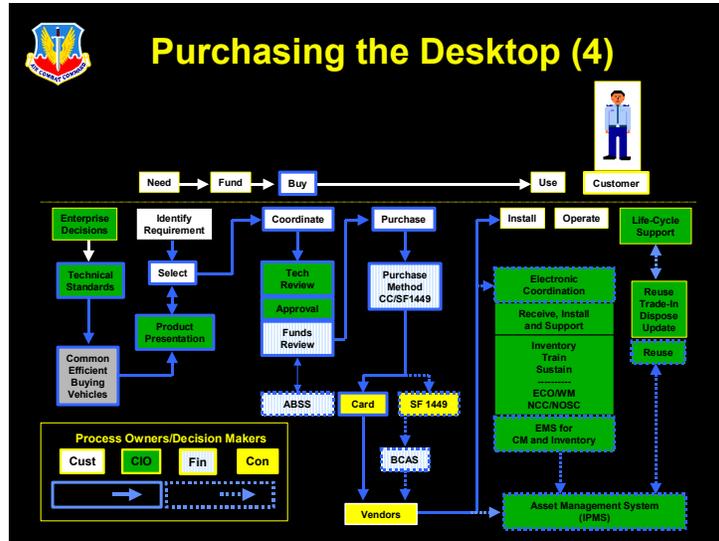
The reason it builds this way is because for everything that has a solid line I have an information technology process that takes care of it automatically (Figure 31). I am in the process of acquiring information technology to take care of everything with a dotted line. You can see that what this desktop or this laptop means for the enterprise, for my organization, for the



ECO/WM = Electronic Central Office/Window Manager

Figure 30

participation of this entity connected with the network, is very involved, with all kinds of responsibilities and interests laid out across the entire organization.



ABSS = automated business service system BCAS = business cost advisory service CM = configuration management EMS = electronic messaging system IPMS = interpersonal message services

Figure 31

What I just laid out for you is the difference between electronic commerce and electronic business—again, a problem with our definitions (Figure 32). How many of you would have said that electronic commerce and electronic business were synonymous, just like Kleenex and facial

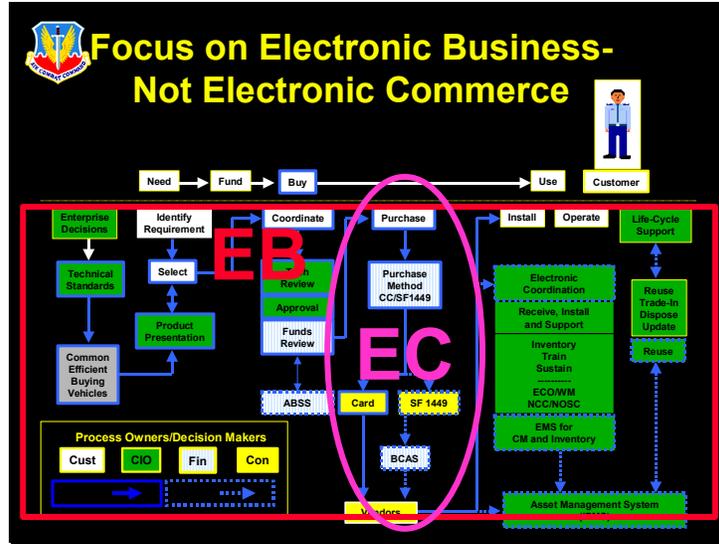


Figure 32

tissue? In fact, they are not. This is where our lack of definitions or lack of discipline and guidance provides a hindrance to our figuring out what we're doing. Again, don't read the particulars, but just look. This is nothing more than automating the order page. This is the business of going through and spending the \$12,684 (I'm pretty close, not exact) that it costs to put a user of an information technology on the enterprise and sustain it, not the \$1,182 that it costs to buy the technology.

The thing I'm trying to paint here is the interconnectivity within the organization. We were talking about reducing bases in the United States. We have things that are interconnected and intermeshed in such a way that if you change one element, you need to understand what it does across the way in order to make a risk assessment and an investment decision (Figure 33).

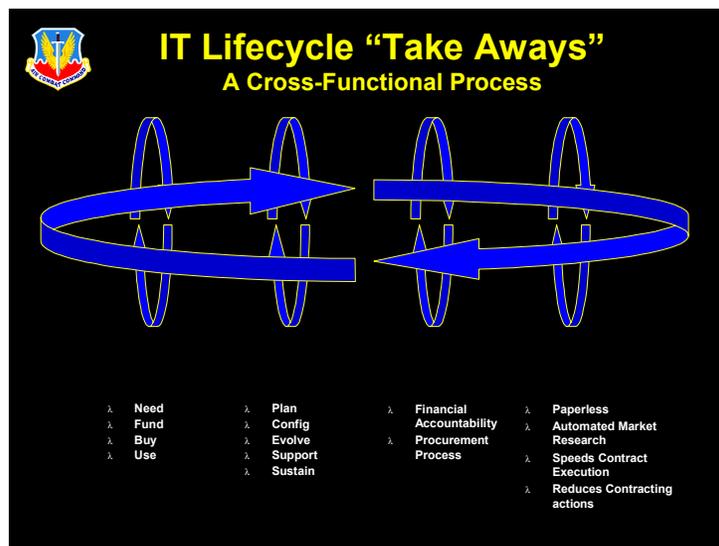


Figure 33

Student: You brought up the point of values and business rules. I would say, in most cases, these values can drive up costs or create interoperability. In most of your examples, as a matter of fact (I'm not even go through all of them), the value that was the problem was trust.

Meyerrose: You're exactly right.

Student: When you were talking about the travel forms or vouchers, you identified part of the cost as the guy who processes the form. They always miss the big part of the cost: that I, as a government employee, have to spend two or three hours getting all the receipts together and piling up all the stuff and stapling it and making five copies so that everybody can file a copy in case the other guy loses his, right down to this buying process. Many of these little subcycles were about trying to make sure that the other guy doesn't screw up his process. How are we going to automate trust? Automation tools don't solve the trust problem.

Meyerrose: You're exactly right. That ends up being a leadership problem—the last part of my presentation, which I'll get to in just a second.

We like to think that there's a technology solution to provide that trust linkage for virtually every human endeavor. You could probably do business that way, but there are certain elements of accountability—whether you're a coalition partner, a member of the organization, a member of the unit, or whatever—in which first-line leadership is the key element to reducing the checks and balances that you actually build into a system. I think it's good to have technology that provides linkages on all those, but you're exactly right. You hit it squarely on the head, which is what I'm going to talk a little bit about in a few minutes. We're never going to get totally away from that, never. That's the human element of all of this.

Since most of you are young enough to be my kids and many of you are embarking from this institution of learning into careers, I thought it might be productive to run through a little bit of how you view yourself in the world and in your position, and hope that maybe it rings true. Again, I will not tell you anything that you folks have not read somewhere else. But I hope that I can say it in a way that's been meaningful to me, and that there will be a “take away” there for all of you.

Leadership is often the missing skill set of CIOs and within the rank and file of the technical disciplines. You could substitute “chief intel officer” in place of “chief information officer” here. You could substitute “commander,” “branch chief,” “supervisor of an assembly line,” or virtually any leadership position that has responsibility for getting people to get a job done. These are things that have been meaningful to me and helped make me successful within the U.S. Air Force and the U.S. military (**Figure 34**). Again, there is no real science here. My list could have gone on forever. But those are the ones that counted, that I felt I internalized and learned the deeper meanings of, and there are only six of them.

I have ten don'ts (**Figure 35**). It almost goes with my two-for-one rule. For military audiences I put all kinds of nasty things up there, but I cleaned them up for you guys. If you're a technical person, the reason why you studied computer science or electrical engineering was because you didn't like that psychobabble crap that the soft majors were doing. You wanted the hard, technical, hit-'em-between-the-eyes engineering stuff. And guess what? If you take that approach, in my view, you will take your education and waste it as training rather than use it for education.



Figure 34

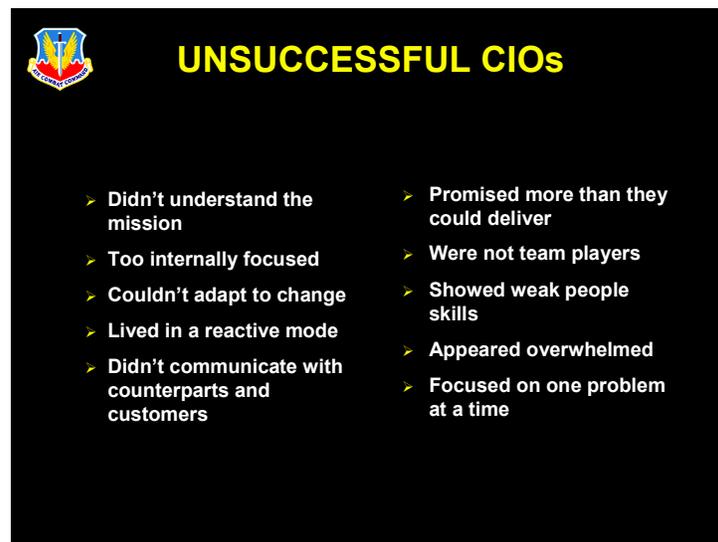


Figure 35

I have a nephew who has been accepted to the Purdue School of Engineering. He wants to be an aeronautical engineer, and he says that his reason for picking Purdue is that they have sold him on the idea that he will be ready for program management when he walks out the doors of Purdue University four year from now. I happen to believe that's largely irrelevant. The reason is that there is not a company in the world, there's not an organization in the world, there's not a military in the world that takes you from a civilian source completely as you are and sees no reason to add organizational values, organizational judgment, and organizational training to your toolkit before it trusts you with responsibility.

Outlook on life is very important to your mental hygiene, your spiritual hygiene, and your ability to be an effective member of whatever organization or family you're a part of. These have been more or less my mantras (**Figure 36**).



Figure 36

I went back over the many supervisors I had. One of them was Al Edmonds. You have all met General Edmonds. He inspired me to come up with this next slide (**Figure 37**). Again, none of this is rocket science. You know most of this. But how are you going to internalize it and make it a part of your daily toolkit? There is a process that you go through. If I could explain to you how to do it, then I'd be a rich person, because each of us is a little bit different. Each of us retains certain nuggets a little bit differently and applies them differently. Some of us build the



Figure 37

Maginot Line and some of us invent the Blitzkrieg. In reality, we all lie somewhere in between. But this has to do with *your* human development.

Let me give you some important lessons I learned (**Figure 38**). It took me too many years to learn them. An especially important one is: If you've got a disagreement with somebody, walk up to him, and the first thing you say is, "You know, I'm wrong about this." Then go on and talk about how you're going to solve it. Whether you're wrong or not, whether you truly believe that or not, you take that off the table.

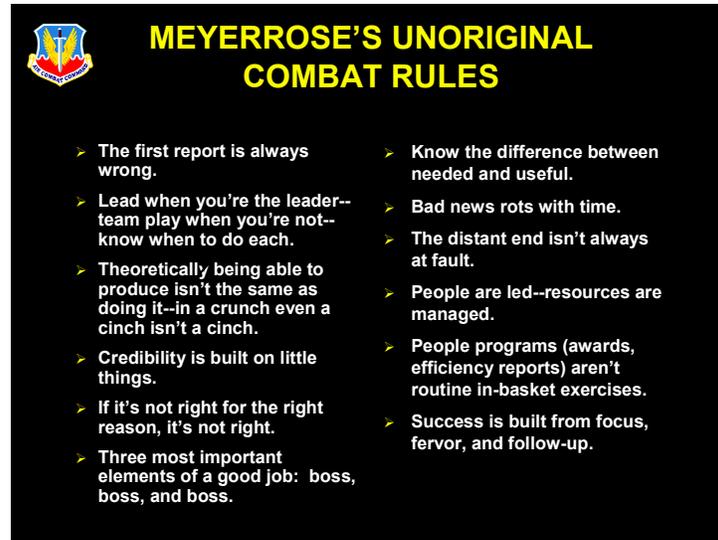


Figure 38

Not too many years ago I officiated college and high school football. I was a head linesman. For those of you who aren't familiar with American football, the head linesman is the guy who goes along the visitor sideline, and he's got the marker behind him that says first down, second down, third down, and how far to go before you start over again. You are right there in front of the visiting coach, and, as you can imagine, in most sports emotions can run very high. When you turn to that coach and say, "Yes, sir, what problem do you have?" it's very disarming. That one people skill is something that I wish I'd had when I was your age.

I want to end by saying that I don't have a job. I have a responsibility—and that is to develop people, marry them with resources, and get them to the right place in time to get the mission done. It is a responsibility that I live every day.

You've all seen I'm in the Air Force, and I've brought my full uniform. I have killed you with enough PowerPoints. I will stand here and talk to you for as long as you want. My airplane leaves at seven o'clock. You can ask me whatever you like. It can be information technology related or anything else.

Meyerrose: Yes. Tony said, "They're going to bombard you with questions." I can probably pull out about fifty more PowerPoints to show you if you want.

Student: There’s a point I’m intrigued by. To set the stage, this week some of us got to hear Admiral Gehman, who came down from Forces Command.² He laid out a construct of a sort of report card on the services and how they’re doing. He gave us marginal marks on the area of being innovative.

Meyerrose: “Us” meaning whom?

Student: The services as a whole, not just the Air Force or anybody else. He thought we should be more innovative. I took away from his presentation that it was a cultural thing; that what’s really inhibiting our ability to innovate and do better things with the forces is not technology. The technology is there. It’s how we’re using it and the perspective from which we’re using it, and the cultural change that has got to occur is really hindering us. I wanted to probe a little bit more in the area of the cultural change business. Do you see that beginning to change? If it’s not, what can we do? Some of us in this room are at the midlevel—lieutenant colonel types or lower—so we wonder what can we do to kickstart that process. Or, if it’s already started, how do we play a greater role in it?

Meyerrose: Let me give you some bizarre feedback that you’re not going to expect. I find the most innovative, outreaching, outward-looking individuals to be, believe it or not, generals and colonels and lieutenants. It’s you guys in the middle ...

Oettinger: The iron majors.

Meyerrose: Culturally, we’ve raised you not to get too far outside that box, because if you get too far outside that box you’ll never make colonel or general. I would give you that piece of feedback that says the problem is middle management. It doesn’t matter whether you’re talking in the government or in the corporate world or the military...

Oettinger: ...or academe...

Meyerrose: ...because change may mean you lose your position, or your status, or your level of expertise, which makes you a treasured and valued employee in that structure. I truly believe that. But let me also hearken back to our earlier discussion about infrastructure and where government money goes and all those other kinds of things.

Everything is connected, and those who can facilitate the most change are those who can figure out what parts of the sweater will become unraveled if you pull a thread and can account for it, mitigate risk, mitigate turbulence, mitigate all those kinds of things. Too often, our middle-level folks aren’t in a position where they can see where those threads being are pulled.

That’s hard for you guys to swallow, because you happen to believe that it’s those above you who draw the box that you have to stay in. I felt that way when I was in your position: “The U.S. Air Force put me in charge of this program, and I’m going to make sure it doesn’t die, because if this program dies, then I obviously did something wrong.”

Oettinger: I just say “Amen,” because it’s true in academe as well. But, again, in the spirit of the balances, et cetera, even the way it sounds is: “If only you could reform captains and majors life

²Admiral Harold W. Gehman, supreme allied commander, Atlantic, and commander in chief, U.S. Forces Command.

would be sweet.” You’ve read my *Whence and Whither*,³ and looking at some of this recurring again and again over a period of fifty years, after a while you get to recognize that it must be functional because there aren’t that many people who are totally stupid and organizations that are totally corrupt. So, what is the functionality?

In this instance, I think the functionality is that somebody has got to do today’s job today. If you are up to your armpits in doing today’s job, then the energy and the will and the time and the whatever to rock the boat and make yourself another boat aren’t necessarily there. The lieutenant hasn’t got that much responsibility, and can dream. The general has a bit of liberation and a mission to galvanize, et cetera. In between, you’re stuck with running the damn thing day to day. So, if you want much more innovation at every level, you also risk chaos. Therefore, setting that balance is not a matter of good and evil; it’s a matter of a very difficult juggling act. In fact, it’s pervasive across organizations, as you pointed out quite brilliantly.

I was late to lunch because my dean was doing an ecumenical thing of bringing together some junior faculty from the Kennedy School and some junior faculty from the Division of Engineering and Applied Sciences, the equivalent of these middle-ranked guys. The idea was to collaborate, have conversations, et cetera. The message was clear. “We’ve got to teach those courses, and, by the way, it’s getting to be one o’clock,” and on and on. So on the one side of the mouth the message was ecumenism, like purple suits before Goldwater–Nichols. On the other side it was, “Remember, it’s your service that promotes you and not any of this stuff you do for the Joint Chiefs.” We’re in the same box and it’s an inherent problem.

Student: I totally agree with what you said, Dr. Oettinger. However, we get back to the point here that the future is a responsibility and the future has to be planned or tackled in a particular way. One of the things that we talked about, and it’s very important, is that when an organization has outlived its usefulness or has reached the crescendo of its output, there comes a time when it either has to be morphed into something else or there has to be a mercy killing. In the military, success breeds success. We learn from our failures, but we really sometimes don’t learn from our successes. For example, two successes from now, somebody might come in and say, “All my predecessors were good. They had a mission. This organization really should be stood down or changed into something else with a different mission,” and go back to the boss with that kind of message. That’s the kind of cultural change that we need. I call them “lidless” organizations, where you can go from one organization to the next without being stuffed in the box. I agree with you, sir, it’s a function of colonels and generals.

Meyerrose: Can I give you a thought? If you really want to precipitate change, realize that change always has risk. The way you sell change is also how you market your risk mitigation.

Student: It’s willingness to take the risk. Sometimes you’ve got to be the salmon swimming upstream, and change comes at a price. Careerism in the military is very important. We are all products of that. However, at the same time, I think that the military is changing to promote more of this kind of debate, where it’s no longer black and white. You’re operating in the gray, and, oh by the way, how different are your shades of gray? That’s the kind of environment we’re in. I

³Anthony G. Oettinger, *Whence and Whither Intelligence, Command and Control: the Certainty of Uncertainty* (Cambridge, Mass.: Harvard University Program on Information Resources Policy, P-90-1, February 1990), [On-line]. URL: <http://www.pirp.harvard.edu/pubs.html>

don't know if you agree with that, but those are some of the things that we are throwing around at the National Security Fellows Program.

Meyerrose: People such as Admiral Gehman are, in fact, doing just that, trying to facilitate change. I've worked for four four-stars in the last seven years. No two are alike, but every one of them, in his own way, tried to provide leadership that says, "How does what we do stay relevant?"

Student: I was going to mention that, in the late 1960s and early 1970s, when the world or perhaps the United States was at the height of the industrial, corporate, capitalist route to power, large hierarchical organizations were truly the only way to succeed. In the business schools, the idea of an economy of scale was rammed down your throat over and over again.

Over the last few years we've seen a technology change, which has also meant that the guy who graduates from college doesn't necessarily go to work for a large corporation. If he doesn't want to work inside those schools, he goes out and becomes a multimillionaire by starting up his own company. We've shifted the power to the youngsters because they're most able to deal with new technology. Our military structures, or our government structures, don't do that. When we have this revolutionary change in technology, they don't shift the power to the youngsters—to the ones who are most able to grapple with it—as our capital structures do.

Meyerrose: There is a fundamental difference that we should never lose sight of. What is the product of that corporate world? The product of that corporate world is a balance sheet. What is the product of the government world or the military? The products of the government or the military are service and trust. So, regardless of how capable the young folks are whom we bring into the U.S. military, no matter how much intellectual growth they provide for us, they do not have the organizational value. They do not have the experience that places things like that in the proper framework of public trust. They do not have all of those kinds of background for dealing with that level.

What you say makes sense, but remember this: Analogies serve a purpose, but all analogies break down at some time, otherwise they'd be the same situation. I think the breakdown of your analogy is that the fundamental purpose of business is a balance sheet, not necessarily organizational or societal values, and the fundamental product of government is services, societal values, et cetera.

Student: General, can I take that argument just one step further and kind of build on that? The young people whom the services are assessing have a great affinity with computers and information technology already, because they were raised from the time they were three on how to use them. The problem set that I see developing is between folks like yourself, who are great, campaign-experienced warriors, and these nineteen-year-olds, whose battleground is the cyber world. I think the ability of a good leader now is linking, because (nothing against you personally) someone in your kind of position probably wouldn't have the agility with information technology that a young person now coming into the services would have, but you have things that they don't have. So today's challenge is bringing those two worlds together, so that the old combat warrior values the skills that the new nineteen-year-old brings in and the two have some kind of common ground. I think that's really what's needed, and what I'm not seeing much of is the ability to try to bring those two worlds together.

Meyerrose: I would submit that is a generational challenge that existed in 1933 with Douglas MacArthur, existed in 1960 with Curtis LeMay, and exists today with me, not that I'm in their category.

Student: If I could back up on that, though, the mechanism for deciding who gets the power isn't that somebody steps back and makes a judgment and says, "Okay, the youngsters are smarter." They get the power by beating the old established power base. What I'm scared may happen to us in the U.S. military is that another country that does have power in the hands of youngsters or people who are able to deal with the technology is going to beat our pants off, and that's how the turnover would happen, not because somebody made a judgment that they could be trusted or could buy better service.

Meyerrose: In my view, you made a great leap to saying, "Technology *über alles*." One of the underlying principles that I tried to portray here, in several fashions, is that it is the human process *über alles*, not the technology.

Student: I have been reading two books. One is called *Military Misfortunes* and the other is called *Normal Accidents*.⁴

Meyerrose: I've read the first one; I've not read the second one.

Student: Basically, these two books develop frameworks to explain technological actions or failures and military misfortunes. I'm curious to know what is the most serious failing you have encountered in your long service in the Air Force, and how do you view the failures?

Meyerrose: Interestingly enough, the earlier question pretty much hit on it. I consider the failing of my generation, the junior-senior leadership, if you will, is the connection with what we call first-term airmen, young company-grade officers, et cetera. We are not able to retain the numbers of young, talented folks in our ranks that we need in order to sustain a hierarchy for an extended period of time.

To give you an example, the U.S. Air Force is a retention organization, not a recruiting organization. What I mean by that is that for us to have the right kind of force to do what we need to do, we must retain sixty out of every hundred people we bring into the service. The Marines, on the other hand, are a recruiting institution. The Marines want an 80 percent turnover. Their hierarchy is only set up to retain 20 percent of the people that they bring in.

If you look at what we have done, we call them bathtubs. We have projections by year of how many officers and enlisted people, in what career fields, we need. We've got a permanent hole, and the only way that hole goes away is when the group that retires that year drops off the end and is no longer a part of our institution.

We have two major bathtubs: the officers in the early 1980s and the enlisted people we brought in after Desert Storm. Our greatest problem (and I've been a part of it) is not providing the right kind of leadership incentives, challenges, whatever you want to call them, to retain the post-Desert Storm generation that we recruited in the Air Force. Yes, there are mitigating

⁴Eliot A. Cohen and John Gooch, *Military Misfortunes: The Anatomy of Failure in War* (New York, Vintage Books, 1991); and Charles Perrow, *Normal Accidents: Living with High-Risk Technologies* (Princeton, N.J.: Princeton University Press, 1999).

circumstances, such as the booming economy. Some folks used to say, “What you need is a good war.” What we really need to make my problem of retention easier is not such a booming economy. Don’t get me wrong, I wish the United States to continue to have a booming economy, and this is a problem I will gladly live with, because there’s a linkage between my institution and the larger United States.

I’ve got to continue to work on getting young folks to identify this as an honorable profession. You’re not going to be a millionaire or get rich, but you will be able to take care of yourself and your family very well over the course of an entire career, and a military career will provide you certain kinds of fulfillment and satisfaction that no other walk of life gives you. My generation has not been very good at communicating that to folks under thirty in our institution. In most of my enlisted career fields, my retention is somewhere around 25 or 26 percent. Remember, I need to retain almost 60 percent.

Oettinger: Again, there’s a bit of a hair-shirt element here. You are working in what is probably the most difficult context today, because the places where you get rich quick are in the computer and communications realm. Maybe twenty or thirty years from now it will be a different realm, but you’re sort of stuck with that and with assuming personal responsibility for a phenomenon that is across the board.

Meyerrose: My solution to that is to advocate within my institution that we train them faster and then get them out. I do not necessarily consider the fact that we don’t retain people in the U.S. military a problem on its own, because I believe it is important for every walk of the United States to have veterans: to have people who know what it is to have performed government service, to have empathy for me and my family, and me and my troops, and me and my organizations—in other words, to identify with us. If there’s no identification with us, then there’s also no political support. If there’s no political support, then my effectiveness as a U.S. Air Force, U.S. Army, or U.S. Navy goes down.

Oettinger: In the civilian realm, by the way, what General Meyerrose just described has been one of the remarkable strategies of a company like McKinsey, which has beaten out other consulting firms by being very proactive in placing the folks who leave. That’s really where their customers come from: the alumni, in effect. It’s a very deliberate building of a constituency or clientele.

Student: Getting back to our lunch conversation, you mentioned that we need to focus more on coalitions and work our coalition forces. I was just wondering how difficult that would be, because you give us slides on paved cowpaths, and obviously other countries have paved cowpaths, too. Can you talk about how this is done?

Meyerrose: Sure. Let me start with macro and then I’ll do a giant leap down to a few more practical things. In the macro sense, the United States has many interests all over the world, and those interests are almost always in concert with another country’s. At any kind of diplomatic or military level there has to be a merging of interests, otherwise there’s no coalition. If you don’t have a coalition, you have unilateral situations, and I cannot think of anything where we’ve done anything unilateral to any large degree. There is a common bond (I don’t mean common as in low standards, but as in togetherness). We, along with our coalition partners, must figure out how to take advantage of that commonality and share it. The degree to which we are able to do that is how strong the coalition will be for whatever purpose that coalition was formed.

You get help with it. For instance, in Kosovo, the help came in the form of NATO. It was more a coalition with NATO partnership than an individual U.S. coalition with the French, with the Russians, with whomever, because there was a structure that forced some of that sameness. The strength of any coalition will be how closely intertwined the interests of all the partners become.

That's a macro view. Getting down to a practical matter, remember we were talking about who supplied what during Desert Shield and Desert Storm and what was meaningful and what wasn't meaningful. The elements of combat support, logistics, and all of those other kinds of things are easier to get your arms around with regard to having coalition contributions than is the pointy end of the spear. No other country has operational stealth, so no other country flies B-2s. No other country has the force-on-force capability of our army. No other country has the carrier force or the task battle groups of our navy. Therefore, to say you've got to come up with the same number of airplane sorties, ships, shells, or bombs to me is not fruitful.

It is truly in the combat support areas where coalition partners can contribute the most and share the most common interests. The combat support things are also the closest leave-behinds for a country or an area to use to rebuild itself: water, fuel, some elements of computer support, communications; things that are of use when you pull the military force out.

Oettinger: Could you segue from that, perhaps, to the question I raised with you toward the end of lunch? Given the pressures on personnel or the pace of technology, given the coalition operations, et cetera, this presumes the reliance on the private sector and on commercial off-the-shelf equipment. This must have increased the complexities.

Meyerrose: It does.

Oettinger: Dwell a little bit, then, on the strengths and weaknesses of military assets versus commercial, in that context of your having to go to Kosovo or to the Sudan or somewhere.

Meyerrose: I was a major player in the command and control arena for the insertion of the Implementation Force [IFOR] into Bosnia in 1995. I was the principal architect of the deployed satellite network that took care of the Army task force that went down and crossed the Sava river and set up camp. Here was a situation where we had time-critical needs, and we had lots of partners whom we somehow had to co-opt into being contributors in this. My personal experience in this regard was that the time-criticality of how we started out was such that we said, "Here's what we've got to do if we have to do every shred of it." We came up with our construct, which said, "This is where the satellite terminals are going, this is where the phone switches are going, this is where the computer nodes are going." In fact, we marched down the planning path that said, "It is going to be all U.S.-only provided."

So, we had a fundamental structure, and then we went about negotiating with coalition partners, mostly through their civilian telcos, in terms of saying, "Okay, this is the node that we have planned for here. Here are the technical specifications and the requirements of that node. Can you meet them?" In many instances, the host country could meet them, in which case we said, "You must design your insertion plug *this* size, *this* wide, *this* whatever, with *this* many inserts into it. If you do that, and can meet *this* timeframe, you can slide your equipment in here and we'll slide ours out."

In essence, from August until December, when we actually put things on the move (that was about the timeframe), I was in negotiation with the coalition partners as to what plugs they could provide. When forces started moving, whoever was a part of it remained a part of it on the initial laydown, and that was going to be the status quo until we reached a steady state. Then they could come in and replace things. So, given that operation, I had five months where there was that pressure to negotiate and find ways in which we could have contributing partners. It was a function of how much I, EUCOM [European Command] and USSACEUR [the U.S. Supreme Allied Commander, Europe] could negotiate those elements. When we ran out of time it was, “Okay, no more negotiating, this is the evolved plan. This is the way we’re going to lay down the forces.” When we reached steady state two months later, we started looking for other opportunities to replace deployed U.S. and British forces.

Student: Really quickly, sir, with the Bosnias and Somalias of the world, the new forces and so forth, there’s a propensity right now that most likely you won’t have that time any more: time to go through a Desert Shield, time to go to an IFOR, time to go to a Kosovo. Most likely the application of direct, decisive power will be overwhelmingly required. That’s where we are looking at overlaying this with the support structure in such a way that you would have a turnkey operation on two platforms: one, the combat platform, which will probably be U.S. led, and the other one the support–sustainment–communication platform, which, as you stated, could be coalition. Do you see any movement in that dimension to try to meet the objective of a future campaign like this?

Meyerrose: First of all, I’d like you to go back and come up with a scenario that is of such grave national danger that it requires us to mobilize that rapidly. I can’t come up with one. I’ve been involved in dozens of operations around the world—as a matter of fact, most of them when I was in Europe, because 70 percent of U.S. operations take place in the European theater—and there has not been a single instance where I’ve not been able to negotiate data landing rights with a foreign country because the country is interested in controlling some of its sovereign territory. That is their sovereign territory, unless you also want to declare war on your coalition partner. I submit that the business of being ready in 24 hours, in 48 hours, or in 96 hours is more of a deterrent than something that is actually used. We still have a strategic nuclear deterrent, and we can exercise that.

I’m now going to say something that’s going to make you Army guys a little upset. You guys continue to practice force-on-force in your training exercises. I submit to you that if we ever do force-on-force anywhere in the world today we will have failed, because we have other, less risky options. So why do you continue to practice force-on-force, tank-on-tank, which is something you’ll never use?

Student: Culture, sir.

Meyerrose: It may be part culture and it may be 100-5 doctrine,⁵ but what I submit to you is that it represents a deterrent capability that is universally respected around the world, just like the Russian and U.S. nuclear capability. The fact that you can do it has value.

⁵U.S. Army Field Manual 100-5, *Operations*.

Student: I really did not make this comment to digress from your point of view. It's predominantly based on the fact that the joint forces commander now has responsibility to provide forces ready to fight, and you to provide off-the-shelf, ready force packages to be launched, not just in terms of ability but capability. It's not just the threat base but actual off-the-shelf capability, where you can take it and insert it right away and the adjunct logistics package with it. That's the reason that I asked the question.

Meyerrose: My point, again, is: Come up with a scenario, from a national perspective, that requires a 48-hour response.

Student: There's no scenario basis, just in the abstract.

Meyerrose: The only one I can up with is a NEO—a noncombatant evacuation operation. This could occur when there's a flood, as in Mozambique, or some other natural disaster, or some kind of terrorist action taken against U.S. citizens stationed in a country. That might be the only one.

Student: I agree with you, sir, if the thinking is threat based or scenario based. But if the thinking is capability based, which is the way the pendulum is swinging ...

Oettinger: But capability for what?

Student: You don't want to answer that question. I just think there are two schools of thought there.

Meyerrose: Yes, and they're competing schools of thought. I would submit that the Army's tradition-based approach anchors one of those schools of thought. It doesn't bother me that the Army has such a concentration on force-on-force exercises as it does out at the National Training Center. But I submit to you that if we ever resort to force-on-force, tank-on-tank warfare using the U.S. Army, we as a country will have failed.

Oettinger: I sit here and listen to the electronic techie argument, and the problem is the same there. If I might put in a plug for the reading you're supposed to do for next week in Greg Rattray's book,⁶ it is precisely this question in the so-called information warfare realm of how you tell a threat that is a modest graffiti-type one from a major one. The logic remains the same: If somebody is going to do you real damage, of strategic proportions, it's very unlikely to happen invisibly unless you're completely asleep on the intelligence side. Therefore, it's a tradeoff between getting a capability, you know not for what, and then finding you have a hammer when you need a screwdriver, versus saying, "I'm going to put some of my assets into intelligence and the like so I can see it coming. Then I have to do *this* kind of preparation to tailor it to the situation, not only to the technical situation, not only to the threat situation, but also to whoever happen to be the allies and the enemies of the moment." You gain a certain advantage. Again, don't think of it as antithetical. If you'll pardon my thinking, this is another one of those damn balances that I'm always urging you to think about, because it has to be continually adjusted.

Student: You are perfectly right, sir, because the next step is that you've got to articulate to Congress why you are asking for so many tanks, or so many aircraft, when you cannot state to them what the threat is.

⁶Gregory S. Rattray, *Strategic Warfare in Cyberspace* (Cambridge, Mass.: MIT Press, 2001).

Student: Force-on-force may deal with tanks. I'm not an Army officer. But, anyway, sir, I was interested in this coalition issue, especially when the United States is a more than equal partner on the bloody end of the spear. I look at some of the problems we're having in Kosovo right now with our coalition forces, and deciding who in NATO is going to do what, in a specific city for instance. There's no doubt in my mind that NATO can't compete in the light infantry world, but that doesn't mean we always want to be the ones who are bleeding. Don't you think there's some way we need to get back with NATO and start closing that gap as people do those types of things?

Meyerrose: I don't think we have become disconnected from NATO at all. I think what has dominated NATO is NATO's own existence and its applicability within the European Union, and Putin turning around and saying, "Oh, by the way, I think Russia ought to be a part of NATO." I think that's a great idea, but NATO, as you know, is set up predominantly as a defensive alliance, and I'm not sure from whom we would protect the Russians.

Student: Themselves, I guess.

Student: Maybe the Chinese.

Meyerrose: Except I would submit to you that the NATO orientation is western, not eastern. I had an instructor at War College who said, "I'm going to tell you in one sentence what you're going to take a year to learn: Everything's connected, everything's related, and you can't do one thing in one area without having an impact on something else." It was one of the underlying things I've learned. Whether or not we retain an embargo against Iran, and to what extent we retain an embargo against Iran, Cuba, or North Korea, has an impact on resultant national objectives, which, again, tweak or adjust what we will or will not use military presence for. Notice I didn't say force, because a lot of times we use military presence and capability that do not equate to force, noncombatant evacuation being one of those, and nation-building stuff, such as helping Haiti rebuild after Hurricane Mitch two years ago being another.

Everything's related, and you want to get to a network kind of setup. Everything's so related that I will not allow a single server to install a new service pack anywhere in my command without my specific approval, because a service pack on a server all of a sudden changes the baseline of every other server in the entire information technology network. Of course, that gives lots of people problems because when they had their own little local area network, they were God and lord and master over who had passwords, who had access, and what the routing table looked like. In a lot of respects, we in the U.S. military do not have control over the routing table.

We're about to come to the last days of the Clinton doctrine. You can say that it's debatable whether a Clinton doctrine is actually something you can write on a piece of paper or whether it's inferences you make that say a particular doctrine has been the end result. Whether or not we perpetuate that as a continuation of national policy will largely depend upon the national election this fall.

Again, those are realms in which the U.S. military operates, not divorced from what we think is militarily proper and essential.

Student: Earlier in your talk, you made a remark that caught my attention, because it relates to my own career experiences. It was about purchasing people saying, "What are your requirements?" and then going out and buying something to fill the requirements exactly, rather than starting by looking at what's out there and saying, "What's the opportunity, and how can I

leverage that opportunity to help my organization?” How are you looking, or how do you recommend going about looking for the opportunities and trying to get ahead of things? Rather than just trying to fill the requirement, how are you looking at what’s out there and bringing it to bear, leveraging it, for the national interest?

Meyerrose: I don’t do much in terms of national interests, but I do a lot with regard to information technology structure within Air Combat Command, where I’m the chief information operations officer. What we’ve driven that to mean is that all decisions about investment in information technology end up being approved, or blessed, under the umbrella of the CIO. In essence, I’ve tried to set up a structure to do just that—anticipate where the mainstream of what we need to do six months from now, or twelve months from now, is bringing on new possibilities. I do not necessarily devote money to it, because that’s what the operational user does.

I’ll give you a good example. Four months from now, my entire command will roll out Office 2000. Nobody has a choice on that. That’s what we’re doing. I’m running a marketing plan right now with the provider, the supplier, and the user. My marketing plan with the user is, “We need to get ready, and come June or July you can expect somebody to come around and your screensaver is going to change.” With the communicators it’s, “You have to configure the servers *this* way. We’ve got to change the routing plan *this* way. We’ve got to do *this*, we’ve got to do *that*, *that*, and *that*. We’ve got to account for *this* number of licenses per node, et cetera.”

I’m not doing that based on any requirement. I’m doing that based upon the reality that I’ve come to the cross in the curve where the marginal incremental cost is low enough that I can assume it, and therefore I’m going to invest in Office 2000, which I’ve already done. Windows 2000 will stretch over sixteen months and not come into being until later, but nobody has given me a requirements document that says I need to migrate from Windows 95, which is my base operating system now, into Windows 2000.

I’ve made a determination, like what Wayne Gretzky said: “My talent was skating to where the puck was going to be.” That’s what I’m trying to do in those regards within the information technology business. I don’t tell you what kind of computer you buy, but I do give you form, fit, and function that you must meet with regard to a standard. You’re authorized to buy any computer on a GSA [General Services Administration] contract that meets that form, fit, and function, and you can choose the make and model. The business about what Web portals we allow, again, is not based on any requirement but on a series of business rules and studies in which I make a determination that *this* is a more cost-effective way of doing something. All of those are based upon what I can see as what’s going to happen in the information technology market.

Oettinger: We are nearing the end of a magnificent, stimulating presentation and discussion, and I want to thank you very much.

Meyerrose: Thank you all very much. I’ve enjoyed myself. I enjoy being challenged, and I enjoyed meeting you all.

Oettinger: Given how high on the list “have fun” was among your commandments, it’s high praise indeed. Thank you.

Meyerrose: I wish you all good luck.

Student: General, here is a Harvard coin. It's a token of appreciation from the Program on Information Resources Policy.

Meyerrose: Thank you very much. I appreciate it. Thanks for having me.

Acronyms

ACC	Air Combat Command
AFB	Air Force base
AUTODIN	Automated Digital Information Network
CINC	commander in chief
CIO	chief information officer
CIS	computer and information services
DSN	Defense Switched Network
DTG	direct trunk group
GCCS	Global Command and Control System
IFOR	Implementation Force [Bosnia]
ITN	information transfer node
JDISS	Joint Defense Intelligence Support System
LRMS	Location Records Management System
MAJCOM	major command
NATO	North Atlantic Treaty Organization
NCC	network control center
NOSC	network operations and security center
SIPRNet	Secure Internet Protocol Router Network
TRI-TAC	Triservice Tactical Network
TTY	teletype
USACOM	U.S. Atlantic Command
USAF	U.S. Air Force
WWMCCS	Worldwide Military Command and Control System
WX	wide area exchange



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