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Space Systems as Contributors to Information Superiority
Keith R. Hall

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Space Systems as Contributors to Information Superiority

Keith R. Hall

Since March 1997, Keith R. Hall has been assistant secretary of the Air Force (Space) and director of the National Reconnaissance Office (NRO). In this dual position, he supervises all space-related matters for the Air Force, and is responsible for the acquisition and operation of all U.S. space-based reconnaissance and intelligence systems. From May 1995 until he joined the NRO as deputy director/acting director in February 1996, Mr. Hall was the CIA's executive director for intelligence community affairs. In this assignment, he was the principal architect and cochairman of the Intelligence Program Review process, cochaired the Security Policy Forum and, with the vice chairman, Joint Chiefs of Staff, directed the study group that led to the creation of the National Imagery and Mapping Agency. From 1991 to 1995, Mr. Hall was deputy assistant secretary of defense for intelligence and security, with responsibility for policy development, resource management, and oversight. In this capacity, he chaired the National Counterintelligence Policy Board and cochaired the Intelligence Systems Board. Mr. Hall served in various professional staff positions with the Senate Select Committee on Intelligence from 1983 to 1991, eventually becoming deputy staff director. Previously, he had spent nine years in Army intelligence and four years as the Office of Management and Budget's budget examiner for the CIA. Mr. Hall received a B.A. in history and political science from Alfred University and a master's degree in public administration from Clark University. He has received several military awards and decorations, as well as the Director of the Office of Management and Budget Award for Professional Achievement, the CIA Gold Seal Medallion, and the Secretary of Defense Award for Distinguished Civilian Service.

Oettinger: I just want to record my appreciation of Keith Hall's putting himself in jeopardy again by traveling up here from Washington. He was kind enough to be here back in 1994.[1] Since then he's had a couple of new jobs. I had written to him that he should feel free to dwell on any aspects of intelligence, command, and control—past, present, or future—that interest him, drawn from his current responsibilities at the NRO, or from his recent past on the Community Management Staff (CMS). I think that is all that's needed by way of introduction. I appreciate your being here.

Hall: I just want to say how glad I am to come up here, because this is always intellectually stimulating, and it also provides an excuse to get out of Washington, D.C. Any time out of Washington, D.C., is a good time. If any of you don't know it, D.C. stands for darkness and confusion. It's what I've observed over the years.

What I thought I'd cover, since Tony has pretty much given me free rein, is to say a few words about intelligence and what I see as the predicate for intelligence in the post-Cold War world. I'm then going to say a bit about the intelligence community—to include some comments on reorganization, which always seems to be the rage, and then on areas needing attention (from my standpoint) in the intelligence community. That will draw not only on my experience on CMS, but also on my experiences over the years. I've been in intelligence for more than 27 years, with about 16 of those looking at the intelligence community in a broad way from outside: the Office of Management and Budget, the Congress, and the Office of the Secretary of Defense (OSD) as well as the Community Management Staff of the director of central intelligence (DCI). Then I'll turn my attention to my current duties and how I think about

[1] See Keith R. Hall, "Intelligence Needs in the Post-Cold War Environment," in seminar proceedings, 1995.

those as the director of the NRO. I'll say a few words about space and why I think it's important. Then I'll talk about today and tomorrow, and what we're doing in that regard. Does that sound about right?

Oettinger: It sounds just great. Thank you.

Hall: As I recall, the last time the students didn't feel bashful about asking questions as we went along, so if we can keep this nice and informal, that's the way I'd like it. I don't have a speech to give. I just have note cards.

Let me say a few words about the predicate for intelligence, because I think that there is always a bit of controversy in the post-Cold War era about why we still need it, and what value it has, and all the rest. I think intelligence is an element of U.S. national power and, to the extent that we are working an alliance with other nations, it brings that element of power to the alliance. It's an element of our national power in that I think the intelligence capabilities of the United States provide the U.S. national leadership, both political and military, a unique ability to know more about what's going on than anybody else. Of course, the role of intelligence hasn't changed; today it is what it's always been, and that is that it helps resolve uncertainty and reduce ambiguity, from an information point of view, in the types of issues and problems and decisions faced by our national leadership and our military.

Intelligence can do a number of things. I think it provides a basis for sound decisions in crisis management, deterrence, and conflict resolution. It can form the basis for sound planning, for sound policy formulation, and also for the allocation of scarce resources, whether that be in the diplomatic, or foreign policy, or economic, or military domains. Of course, it can only do this if it's reliable, accurate, timely, and digestible by the decision makers. Obviously, it *can* do this, but it doesn't necessarily always do this, because sometimes it's ignored. Just because our U.S. decision makers know something, or we've provided it in a timely, accurate, reliable, digestible format, doesn't mean they're going to use it in decision making. I would give you the observation, as a 27-year intelligence officer, that policy and military successes occur because of the wisdom of the people forming the policy or conducting the operation, and military failures or problems are often the result of bad intelligence, not the result of bad policy or bad planning, or any of the rest of that. As an intelligence officer, you just grow up to live with that as a fact.

What intelligence is not is probably just as important as what it is. It is not a crystal ball, and most of the criticisms that I see written about the intelligence community are usually about how we failed to predict something: failed to predict the fall of the Soviet Union and the collapse of communism, for example, or failed to predict the invasion of Kuwait by Iraq, or whatever is the failure du jour. Policy makers and military commanders and all the rest, I think, would like to have their intelligence delivered in a crystal ball, but the fact of the matter is that we are still talking about human activity and human developments, and predicting what human beings are going to do, either singly or in groups, is still more of a mystery than it is a secret that we can go after. The intelligence business is going after secrets. We can't resolve mysteries, and we can't provide a crystal ball.

It's also not a substitute for decision making. Intelligence is just one of the factors that a decision maker has to bring to bear on a problem, and frequently intelligence folks can get pretty frustrated because, based solely on the intelligence, there appears to be only one logical decision to make, and then the policy maker will make a different decision. That's because there are a lot of other factors—political, military, training—that can come in and be brought to bear on a policy or a course of action. Intelligence is just one aspect of it.

Third, intelligence is not risk free. This is a risky business. There are going to be mistakes. The very nature of intelligence activities frequently calls for breaking laws in foreign countries—at least their laws, not our laws. It's going to have its array of mistakes. It's going to have embarrassments for whoever engages in it. It's going to have some spectacular failures, and when they occur, those usually get a tremendous amount of publicity. I think that forms the backdrop for what the American public thinks of when they think of intelligence. The other backdrop

is James Bond movies and things like that. Neither of those extremes is what intelligence is all about. For every failure, there are very, very many successes, big and small, and I know of no intelligence operation or activity that even bears any resemblance whatsoever to James Bond.

Lastly, of course, intelligence is not omniscient. We can't resolve all ambiguities, or reduce all uncertainty, no matter what, for obvious reasons.

Now, let me say a couple of words about what I see as the evolution of intelligence, because I think it bears on some of the things I'm going to talk about later. First of all, the human dimension of intelligence seems to me to be a constant in terms of human intelligence—espionage, if you will. I would say that there is no intelligence problem or question that would not benefit from a well-placed source somewhere who tells you everything you want to know with 100 percent accuracy. That is always the case, and that is why, no matter what resources are put into intelligence, no matter what technology is applied to it, there is always an argument to be made that what we need is more and better human intelligence. That's what people tell you all the time.

The second part on the HUMINT side is the need for analysis. Since you're trying to ascertain what human beings are doing and what their plans or intentions might be, or what's happening, it involves the human mind, which is the best engine yet invented for fusing various sources. While we look for ways to make this easier and to have machines do this for us, the human mind is still the most important element in the whole intelligence business.

Student: I've heard that argument in the past. Critics have said that the failure to predict the fall of the Soviet Union or the failure to predict the invasion of Kuwait has been due to lack of HUMINT collection or the lack of human resources. Has that influenced the CIA's or the intelligence community's hiring practices in the last couple of years to, say, hire more case officers and place less reliance on satellites, for example? Or is that a balance that has to be made?

Hall: I'm going to talk in a moment about what I call the "perversion of the budget process." One of the perversions of the budget process is a desire to hold down government employees. As a consequence, the things where human beings make a big difference—human intelligence, espionage, and analysis—are subjected to the same constraints as people doing acquisition, or people performing other functions in the Defense Department, where we probably do have way too many people and bureaucracies and all the rest. So, one of the perversions is that you have to bring down the number of people in the intelligence community just as you do in the Department of Defense, so you will find fewer people doing HUMINT, and fewer people doing analysis. What the intelligence community tries to do is manage it in a way that focuses it on the most important targets. So, you will hear the HUMINT managers tell you they're doing a better job today than they did five years ago, but not on a global basis. That's against particular high-priority targets.

Student: Do you feel there's an overreliance on satellites and information technology and those types of things as compared to human intelligence, or is there any way even to know that?

Hall: I'm the advocate for satellite intelligence, so you'd be amazed if I said anything different. But, no, I don't. I think that the more information that is available from a variety of different sources and types, the better the predicate for sound decision making, sound planning, and all the rest. The key is to find a way to digest it all, and I'll talk about that.

I'll tell you this: I would be in favor of resource strategies that don't constrain this human dimension of intelligence—the analysts and the human intelligence activities. I'd say, "In this area, do what makes sense." Even if you double the HUMINT budget, it's just a blip in the overall intelligence spending scheme. Analysis gets a little bit more because they get into information technology and all the rest. But even there, if you have a sound proposal that someone can put forward that says, "Hey, if I do this, it's really going to make a difference in our ability to under-

stand something," I'd say give him the resources—a few people, a couple of computers. I would not constrain either HUMINT or analysis from a resource point of view. I'd have all the competition in the technical systems. I will agree with that, but I wouldn't agree that you don't need technical systems or that there's an over-reliance on them. It saves our butts too often.

The second thing in the evolution of intelligence is improving technical tools and techniques that aid those humans: satellites and computers and information systems, and communications, and all the rest of that. There's ever-increasing timeliness from the HUMINT environment of 100 years ago, with our diplomats abroad saying, "This is what's happening," and you post it by mail or by courier, and the folks back in Washington learn about it three months later. Today you can have instantaneous knowledge in the intelligence arena, just as you can in the worldwide news business.

Higher volumes and quantity. We can collect an awful lot more today than ever before. There are also decreasing security requirements in the intelligence business for two reasons. First, it's just a fact of life. On things that you'd like to keep secret, the cat gets out of the bag and the overall need to keep it in some dark corner of the government's operations goes away because everybody knows you have it anyway, so you can reduce the security.

Then there are other things where I think the security just isn't as important anymore because there is such a wide variety of ways to learn something that the fact that you know it is no longer secret. Just because you know it, they can't discern how you learned it, and, obviously, the thing you're trying to protect in intelligence is sources and methods. In the past, for example, if you think of the Soviet Union in the late 1940s, probably if we let out that we knew something was going on in a particular location, maybe the only way we could have known that is by some human penetration of the outfit. Now, there are various ways through which we can know about a particular activity underway in Iraq or deep inside Russia or wherever it is, so we don't have to protect the fact that we know something as much as we did before. So, you have those two and probably other reasons that you could cite for a declining need for security that goes along with this vast amount of information that's available and more timely. I'll get back to the significance of that in a minute.

Let me talk a little bit about the intelligence community. I can't remember whether I said this, Tony, when I was here in 1994, but it's one of my favorite lines, and that is that it really isn't an intelligence community; over the years it's been more like a guild. It's a bunch of competing agencies—often competing agencies that would just as soon see their sister agency go out of business. But because we're all in the same business, we sort of bind together to promote the common good. That has characterized the intelligence arena for a very long time, and usually is the basis for a lot of criticism or calls for reform and reorganization.

In terms of organization, the difficulty facing the intelligence community is not unlike that facing anything: the need for specialization on the one hand, and integration on the other. If you look at the intelligence organization (and I've done this over and over again over the years), I think we have it about right. There is always room for improvement, but now, particularly now that the National Imagery and Mapping Agency (NIMA) has been created, there are more important things to worry about than the intelligence organizational arrangements.

I believe that most proposals for reorganization of the intelligence community have their roots in turf grabs from one to the other, getting back to the guild notion, or hangovers that people have from past problems that they experienced in dealing with the intelligence community, either as someone inside or someone outside. Of course, that doesn't come as a shock to you: that's what most of the controversies are frequently about, regardless of the field. But I don't think that there's much efficiency or effectiveness to be mined in rearranging the wiring diagram of the U.S. intelligence community. Now, I do believe that there are plenty of areas requiring improvement, not in an organizational wiring diagram sense, but in breaking down the barriers that do exist between the intelligence agencies.

First of all, the budget. The best way I can describe it is that the budget is a perver-

sion in Washington. It drives the agenda, and I think it plays too large a part in driving the policies and the thinking of each of the entities that are users of intelligence or purveyors of intelligence. Too often the effect that it's going to have on one's budget acts as a significant constraint and restraint on free and effective dialogue among the intelligence agencies. As director of the NRO, it is dangerous for me to say such things as, "There is an imbalance between collection on the one hand and processing exploitation and dissemination on the other," because that directly assaults my own budget. But, if you take a look at my speeches, you'll see that I've said that. If you are the director of the Defense Intelligence Agency, it is obviously dangerous for you to call for more collection because the Defense Intelligence Agency doesn't do very much collection. It's primarily an analytical organization. So, important dialogues about intelligence activities are difficult to come by in Washington in any official sense. Almost all of the good dialogue takes place in informal meetings that are not classified as decision meetings or policy fora or what have you. It's the luncheon meetings and occasions like that where people really say what they think. But the budget process—and this isn't just in intelligence; I think this is across the board—interferes with what each of the services may be inclined to say, for example, Army, Navy, and Air Force, or even the secretary of defense.

I can't offer you any solutions to this. I can say that when I was at the CMS working for John Deutch, both there and in Defense, I pressed for fora that brought the DCI and the SECDEF together more effectively to discuss budget issues. There's a thing called the Intelligence Program Review Group that reviews intelligence across Defense and the DCI's arena. Then there's the EDRB, an Expanded Defense Resources Board, that brings together the Defense officials and the intelligence community officials for decision making on the budget. I would report to you that I think there's been some minor improvement in the discussions, but the overall perversion in the process still prevails.

The second area for improvement is security. There is obviously a high value and importance that an intelligence agency has to attach to security, particularly if you are engaged in a technique or a method that is easily countered if the bad guys know that you're using it. On the other hand, too often in the intelligence business, security is used as a bureaucratic control mechanism to stay in charge of the particular turf that is associated with the area of security concern. What that promotes is the idea of information ownership, which, obviously, gets in the way of dissemination and effective use of the information and all the rest. It generates unnecessary cost, and it also creates loss of effectiveness.

So, we need to have an overhaul of our security system, not just in the intelligence community, but I think across the government. Some of the recent things that you've undoubtedly seen within the last couple of years—the Security Policy Board, the report of the Blue Ribbon Commission on Security and all the rest—have good recommendations in them, but there are still too many people who can prevent information from flowing for turf reasons, and not on security grounds. So, I think that's another area that needs some attention.

Dissemination. I think there's been tremendous progress made in this regard because of things you may have heard of, such as Intelink, which is really nothing more than the intelligence community's version of the Internet. So now most users, if they have the right security clearance, a modem, and access to a comm line, can connect into virtually everything that the intelligence community holds across the board on any subject.

The next challenge in the dissemination arena, aside from just buying communications capacity (and I'll say more on that in a minute), is finding a way to organize the data and display it. As I said before, the nature of intelligence now is more timely information in much greater quantities, and that's just the intelligence piece. That's not even talking about what's available openly. We can inundate users in data. Now our challenge is to figure out ways to provide that data in a way that assists decision making.

Intelink doesn't do that, because it's as ubiquitous and as diverse as the Internet itself. Each home page has its own organizing principles. You have to find a way to ferret out how to get the information digested. You don't know whether what one home page

says is happening and what another home page says is happening in the same thing is based on two different sources or the same source. So you can't even tell whether one agency is confirming what another agency is saying. They can all be based on one very fragile, unreliable source.

Oettinger: Could I break in and ask you to elaborate a little bit on something that goes back a couple of minutes ago to bureaucratic impediments, and then contrast that with what you're saying right now about putting some order into Intelink? That implies some measure of coordination, some measure of standardization, some measure of agreement on something or other, which is probably then another good forum for obfuscation and foot-dragging and so on, *ad infinitum*. My own recollection is of being drawn into a dispute within the intelligence community some 35 years ago over how many columns of an 80-column card would be used. I took this seriously for about 15 minutes as a technical argument until I realized that what was really going on was folks arguing for their own version because it was a good way of saying, "Thou shalt not share my resources," but not *saying* that. Instead, they were saying, "I'm a good guy. I'm arguing technical standards." So, how can you be concerned over bureaucratic obfuscation and, at the same time, ask the folks to collaborate on standardizing? One is a recipe for disaster for the other.

Hall: I think that the root cause for lack of standardization in the intelligence community isn't tied directly to bureaucratic in-fighting among agencies. I think it has its roots in the feeling that you own certain customers. Those customers have certain needs to which you want to be able to tailor your product. An approach that calls for one-format-fits-all leads to diminution in your ability to be able to provide tailored support. That's putting the best face on it. I understand that, and there are probably more evil purposes at times that come into play from a government standpoint. But I really think that most people would love and welcome standardization if it could occur in a way that still allowed them to pull together the tailored products that suit the needs of the customers they serve.

For example, if you went to the Defense Intelligence Agency, they would feel direct ownership of the Joint Staff as their customer. If you went to the Air Force Intelligence Agency, the Air Force is their customer. For the CIA, it's the White House, and so forth. One of the things that was interesting in the Intelink arena was that as it came on line, I think there was some nervousness that the people who would be using it could go to different sources: the Joint Staff can not only touch base with the Defense Intelligence Agency, but, my goodness, they can also touch base with everybody on a particular example.

The CIA at first refused to be part of Intelink. They weren't interested in it at all. But they very quickly realized that if they didn't get on Intelink, they'd be irrelevant, because that's what everybody went to very rapidly; I mean thousands and thousands of users, literally, in just a few months. So the CIA generated its own version of Intelink, called Policy Link, to connect to their customers, which means that basically their customers at the White House and the State Department and the Congress and elsewhere, if they wanted to connect with CIA, would do it via Policy Link. That kept CIA sort of in charge of their own customer set. But that only lasted a short period of time, and now there's a pathway through Policy Link into Intelink.

I think that's the challenge: finding a way to allow for standardization and still allow for the development of custom products to support different applications and uses. The way you do that is with a system engineering approach to organizing the data. If one can find a way to pull the data sets together at the lowest level, that would allow for interaction of either an intelligence agency or the users themselves to fashion the data in a way that's tailored to their need. But the data organization and standardization clearly have to occur. I think we now have a common dissemination concept: not only Intelink, but also the Global Command and Control System and various other things that are being pursued in DOD. Then, the real key is going to be displaying it. If you go on Intelink, so much of the display is just written words, and it's really difficult to digest everything that's available in written form. So, we're going to

have to have a better way of displaying the data.

Fixing the comms, the communications. We refer in the intelligence community to "disadvantaged users." The thing that makes them disadvantaged is comms. They don't have the communications capacity to receive information, to request information, to interact with these huge amounts of data that are available. Although the intelligence community gets blamed for that, that is primarily a user problem. I daresay that if CIA came forward and said, "Here is the radio that has to be put on a tank or a Humvee or an airplane or onboard a ship," the services would say, "Get out of here. We are in charge of what's going to go on a ship, a tank, an airplane, a Humvee or what have you, or in our command and control centers." The fact of the matter is that the intelligence community can't buy, can't array, the communications capacity that a State Department mission overseas will use, any more than it can for the U.S. Army deployed in the field. They have to do that themselves. Many of the problems that got tagged on the intelligence community in the Gulf War were all associated with two things: inadequate tactical reconnaissance capability and inadequate communications to move information around. That has got to be fixed. No matter how well we can do things in Washington, or out at a CINC area, or at a joint task force where you have pretty robust comm paths, if you don't fix it down at the component level and at the operating force level, the user is never going to be able to benefit from the tremendous amount of information available.

Student: You talked earlier about the organizational structure, and how you felt that you're nibbling at the edges of mostly a turf war. Could forced turbulence at the organization level build to an acceptance of standards? Could that be the principle that forces people to think in new ways: to say that if your boss is here one day, and it's a different boss next year, you're going to have to provide adaptive systems in a structure that you're using to be able to build to a common standard? Is there somebody big enough to impose a standard? Bill Gates got lucky.

Hall: Right now, no. There is nobody with the authority to do that, short of the secretary of defense himself. I'd say the secretary could, but he'd have to do so on the basis of some advice, and there's a cacophony of players in this that's available to advise the secretary.

There are basically three levels of systems. In terms of architecture, you have an operational architecture, a systems architecture, and a technical architecture. The problem I see is that we can probably pretty well define the operational architecture in terms of what people want. But once they start interacting with a much more capable, interactive, virtual database of all the information available, we and they will learn an awful lot about how that can change the way they do business.

I think that if you went to an ambassador overseas, a battle group commander, a joint forces air component commander, or someone like that and said, "What would you like in the way of an information display?" we know the outlines of what they'd like from an operational point of view. They'd like one-stop shopping. They'd like one virtual scope that they can interact with that tells them the status of blue forces, the status of red forces, the weather, projections on what's going to change, terrain, what's moving, and all that. They would like to interact with one system, not 17 different systems as we give it to them today, and they'd like all this to be multilevel security. From an operational architectural point of view, I think we pretty much have that.

From a technical architecture point of view, we know that things like the Global Command and Control System and the Joint Technical Architecture and a variety of things are being worked to develop that. What we are missing, in my judgment, is that middle layer: the system of systems, the systems architecture that's going to allow this to happen. Each of the systems has its own parent organization that has already decided how they're going to build it, what it's going to output, whom it's going to go to, and that's the part that needs work.

So that middle part, system engineering, is what needs to be done. I think that the way you break through the bureaucratic barriers is

to go off and tell somebody to build a system tying together some significant subset of this data. For example, if you had NRO and the Air Force go off together, and just the two of them sort out how they would bring the data that their systems generate together on a single scope, you'd have a very large part of the problem engineered from a systems point of view. That's only asking the Air Force and the NRO to play nice in the sandbox together, not a whole bunch of other people. If you build that, and it's good, and you bring that to the operational level, you won't be able to stop its expansion. It's sort of similar to the Intelink.

Student: I guess what I'm advocating is that when you start talking about doing what we did with NIMA, when you take these organizations and you bang them together, you make them play in the same sandbox.

Hall: Yes, and, as you know, I was one of the implementers on NIMA. I cochaired the task force with Admiral Owens on standing up NIMA, and that was one of the concepts. We'll see how long it takes when you generate so much turbulence to achieve results by that route. I think that it's absolutely necessary. Obviously, I was an advocate for doing it, but I don't believe that's going to yield near-term improvements. I think it's a long-term thing. By the year 2005 you will see a much improved use of imagery data by the intelligence community and the Defense Department as a result of that move. But we probably have taken a dip downward in the near term because of the tremendous turbulence.

Student: But without it, don't you think that in 2005 you wouldn't see anything close to what we're actually going to see then?

Hall: In this case, I think that's right. But if you start talking about merging the NRO and the Air Force, or the Navy and the Air Force, that's too big a change. Merging the Defense Mapping Agency and the various entities in the intelligence community that did imagery is about the right amount of change. Remember: when I say Air Force, I'm not just talking Air Force intelligence. I'm talking about all the things that aren't intelligence. I'm talking about weather, command and control, and all the rest of that. You'd have a four-year food fight just trying to figure out how to do it.

It took us a year to figure out how to pull together NIMA. Actually, the very first recommendation on NIMA was made by the Senate Intelligence Committee in 1989. I wrote the report. That went nowhere. [Robert] Gates, when he was DCI, formed a panel to look at imagery. That panel recommended what is in effect NIMA. That got turned down. We started in 1989, and NIMA was created and stood up in 1996, so you have a seven-year path toward the creation of an agency and, I think, at least three years before you start seeing some concrete results. That's 10 years. For something like what I'm talking about, I think that the path toward improvement is a hell of a lot better if you just get two agencies to partner as opposed to one gobbling up the other. So that's precisely what I'm trying to do. I'm going to talk more about Air Force/NRO partnership. But, if you do it that way, you've got 80 percent of the data. If we find a system engineering approach that pulls just those two data sets together—NRO and Air Force—as I said, if it works, there's no stopping its expansion.

Student: What is the relationship between NRO and NIMA?

Hall: I call NIMA my mission partner. Why don't I come back to that, and I'll say a few words about it.

The other thing that the intelligence community needs to do is connect to customers. I know that's sort of trite to say, but I'm talking about it in a different way. The intelligence community, through its history, defines its activities in terms that it understands, not in terms that the users understand. One of the things that I've really glommed onto in the last couple of years is that difference. Let me give you some examples.

The intelligence community looks at Joint STARS, the Joint Surveillance Target Attack Radar System, as an MTI (moving target indicator) radar that does MASINT, measurement and signatures intelligence. For the people who build Joint STARS, and if you look at how it's classified in the Department

of Defense, it's a battle management system. I think that example alone shows the problem that the intelligence community has. If I go to a user—any user around the world, not an intel guy, not a radar expert, not an operator—and say, "Do you need Joint STARS?" they'd connect that immediately to battle management. "We've absolutely got to have it; we really need it," and all this stuff. If I go to them and say, "Do you need MTI?" they say, "No, I don't need MTI." "Do you need imagery?" "No, I don't need imagery." "Do you need SIGINT?" "No." We talk about these things in technical terms and phenomenology terms that all relate to intel folks. "I need SIGINT. I need imagery. I need all-source analysis. I need counterintelligence." You pick it. These are meaningless terms to the user.

When John Deutch was DCI, he gave me the task of inventing what he called "mission-based budgeting." I failed miserably. I can only take some solace in the fact that the guy who replaced me at the CMS when I moved to the NRO hasn't done any better. But the objective here is to describe the intelligence budget in terms that relate to the user, not in terms of the intelligence community. It's the way the Department of Defense looks at its mission areas: it's theater missile defense, ballistic missile defense, air interdiction, and submarine warfare. It's not placed in terms of a function or a phenomenology.

So, that's the first thing the intelligence community really needs to do to connect to its customers. The fact that the intelligence community thinks about it this way shows one of the barriers to its own ability even to relate to its customers.

Then I think the intelligence community obviously needs to operate to meet current needs. We have to take advantage of current capabilities to find better ways to empower our customers' operations. More importantly, because there is a limit to what current capabilities can do to support current operations, we need to connect with customers to design future capabilities that connect to their future operating concepts and make a difference for them in terms of their warfighting. Of course, one of the things that folks like Admiral Owens had in mind was that with the right amount of information, you need to apply less force. You need to put fewer people at risk. He believes that, and there are other disciples of that within the Department of Defense. The whole Revolution in Military Affairs, I think, is predicated on that. But it's not going to happen unless we can connect future ops concepts with future information capabilities. We are not well situated to do that, in part because of that problem that I just talked to you about. We think about it in phenomenology terms, not in terms of how it's used.

I think that the main problem in the C4I arena is not within the intelligence community; it's between the intelligence community and its users. All the focus tends to be on the intelligence community. Tweaking and moving around the wiring diagram, and changing roles and missions and all of that stuff is marginal. The area crying out for improvement is between the intelligence community on one side, and its users on the other, and the intersection of those two is C4. So I will say for the record, or I'll allow Tony to keep on the record, that the recent changes being contemplated in OSD can be good if they do it right.

Information dominance is a buzzword, just like information superiority, and in Joint Vision 2010 it is the predicate for all future military operations and how the United States will prevail on the battlefield in the future and so on and so forth. Let me say a few words about that.

The key here is going to be staying ahead of the world that's catching up. How does the United States stay ahead? I think we stay ahead by development on the ISR (intelligence, surveillance, and reconnaissance) side of new sources and methods. That means exploiting new types of phenomenology other than the ones we exploit today, or analytic approaches and fusion approaches that use the information that we have in new and different ways. That's about all I care to say on that. But, clearly, that's one area/path toward information dominance.

The second is application. In the past, we've been able to achieve information dominance, I would say, because we were the only ones with the particular type of information—satellite imagery, for example. That's not going to be the case in the future. Indeed, I think some of our future potential adversaries may have pretty capable imagery

systems that they can rely on. So where we will get our edge, among other places, is going to be in our application of imagery to the tasks that we're trying to perform. We already have a very good understanding of how to use something like imagery for the conduct of military operations or assessment of situations, or whatever it is. We need to make sure that we apply our resources in that way.

Fixing the information infrastructure is a predicate to information superiority for the reasons that I've already given. But when I talk about fixing the information infrastructure, I think we have to rely on commercial technology. The government should get out of the business of trying to design it. I don't think that the government is any longer the center of excellence for any of this stuff. Commercial industry will deliver us the products, the capabilities, and all the rest. What the government needs to do, but probably won't, is figure out its unique needs and cause the necessary technology to be developed in conjunction with the commercial side, and interoperable with the commercial products. It would be prudent for us to make some assumptions, for example, about what the technology is likely to be like in the year 2005 for such things as bandwidth, data compression, storage capacity, virtual reality (you pick it), and to design concepts with that in mind, even if the widget hasn't been invented yet. Otherwise, what we're likely to do is design to what we currently understand information technology to be, and find that by the time we deliver it and deploy it, it's 10 years out of date because of the pace of information technology development.

Oettinger: Let me argue that it may be even harder than that, because if I hear you right, you're implying that if one has a vision of things 10 years or whatever out, you can sort of design toward that homogeneously. Judging from the past, my guess is that the changes will so rapid that you can only tailor one piece and then the next one is going to be different. It's like some crazy-built house, so you're lucky if the floors are within one step of each other, but it's better than going outdoors.

Hall: I realize the difficulty in this, but what I'm saying is that if you look at NIMA, for example, they're talking about imagery storage devices that will be employed with future NRO systems that will be delivering imagery. They will make an assumption, based upon what's currently in the laboratory development, as to the storage capacity of whatever media that they're looking at, and design their whole architecture around that type of approach. My future imagery systems aren't going to be here until 2002. I guarantee that storage is going to be much better, much different than whatever it is that they're designing to. So that's all I'm saying. I don't think you have to make a judgment as to the widget that's going to be there, but I think you'd be wise to take whatever current state of the art is and go several orders of magnitude more than that as your projection for what's going to be there in 2002. We'll probably find that we've grossly underestimated what's going to be there, even with that approach.

Student: That touches on something you mentioned before about coming up with the people who are qualified and have the skills to make those kinds of estimates, because you're competing with industry—even the entertainment industry—and everyone else for that talent. How do you get around that?

Hall: Where I think the NRO has an edge in that regard is that 93 percent of the dollars I spend I put on contract. So I don't have the limit that I would have if the government were doing this: that I can only pay a certain amount to the software engineer or software developer. That software engineers are probably the scarcest commodity these days and find themselves jumping from job to job every year with a 20 percent pay increase is certainly a factor in increasing my costs, but I can pay whatever it takes. If I put this task on industry, I can get the best and the brightest.

Student: As long as you can get those best and brightest people away from higher-paying jobs.

Hall: We were talking about this at lunch. In terms of the 93 percent of the dollars we put on contract, the NRO used to benefit and was

getting the best and the brightest in U.S. industry because this business area had a certain allure for them. The engineers would want to come on it because it was the high-tech end of the business, the state of the art, and so forth. Now, there's competition in industry out there, both on the commercial satellite side as well as from such things as the entertainment industry if you're talking about display and virtual reality and all of that. The benefit of that is you don't have to take a polygraph in order to do business with Disney. You do if you're going to do business with the NRO. So, yes, there is that competition, but we still get a very large share of the talent out there.

Anyway, those are just my observations on the intelligence community, for what they're worth. I'd like now just to turn to the NRO side of the equation.

Let me start out by saying a few words about space, and why we still even need to worry about space. There have been some people, members of the Congress and all the rest, who have referred to the NRO as a dinosaur of the Cold War. They say, "We don't need these systems anymore, these spy satellites."

Space, unique among other alternatives, provides global access. The term "space" applies whether you're talking about satellite reconnaissance or some other function that's derived from space. I would point out that if you have a space system, you're a tasking message away from focusing that space system on whatever is of interest at the moment. The world environment that's projected in the Quadrennial Defense Review, the National Defense Panel (NDP), and all intelligence estimates (and it's good to know that all three of them are saying the same thing), is basically more of the same through the year 2010: all sorts of trouble spots popping up that we have to deal with—operations other than war, humanitarian problems—all of that probably turning a bit more ugly in the post-2000 timeframe. They talk about asymmetric threats; I'm sure you've heard this. So, the benefit of space first off is agile access globally.

Second of all, the use of space systems is not provocative. If we really want to know what's going on in North Korea at any moment in time, it's probably pretty provocative, particularly if you're in a crisis, to send an aircraft overflying Korea. If you have space looking at them, it's nonprovocative.

Third, you don't have to stage anything from foreign territory. You don't have to get anybody's permission to use it. For example, during the recent Iraq crisis, there was a big deal as to whether or not the United States was going to be able to stage some of the additional military assets in Saudi Arabia that were needed just to watch what's going on—AWACS, for example. You don't have to worry about that with space systems.

Fourth, you don't have any operating forces required forward. There's a tail associated with operating sensor systems, or communication systems, or what have you, that has nothing to do with support of the operation. If you can provide communication services—intelligence, surveillance, and reconnaissance services, navigation services—without having to deploy the first person forward to operate it, that means you can put more combat power forward.

Fifth, there is very high volume available from space. Obviously, if you're out in space you can see or hear or listen to a very large area on the ground.

Sixth, space is getting cheaper. It's not as expensive as it used to be.

Finally, I would point out that space is a unique advantage of the United States. Over the years, we've put hundreds of billions of dollars into the development of space systems, their operation, and how to use them. If you're alone in the world, the price of entry into space is high for two reasons. First of all, just to get into the business you have to have an infrastructure to support the systems, something the United States already has: launch bases, ground stations, and all of that. Secondly, you have a technology and learning curve in the development of the space capability and in how to use it. I talked before about intelligence being an element of U.S. national power. I think that the space area is another one that is clearly part of that element of national power, and it's uniquely U.S. ... and other key players around the world, most of them in the West.

Student: What are the disadvantages of space?

Hall: A good question. I have the list. First of all, it's expensive, even though the cost is coming down. The reason for that is you're deploying a system that you're never going to touch again. So it's got to work the first time and continue working without your being able to send a mechanic up to fix it.

Secondly, you require a means of getting the information, or whatever it is you're doing, to the user. It's not collocated with the users. You're almost always going to be at a distance from them; and, therefore, you need a means of providing it. Now, some of these satellite systems provide that service directly; GPS, for example, the Global Positioning System, interacts directly with the users. Other systems can have direct downlinks where the data goes directly to them. But, by and large, there is a distance between the place where the information or the service is available, particularly in the ISR arena, and the users, and you've got to make that connection.

That is exacerbated by the problem I mentioned before about disadvantaged users in not having the comms. One of the things you frequently hear about the NRO is, "They'll have the information; it will be in Washington; and I'll never see it." They'll never see it for a variety of reasons, not the least of which is they don't have the comm capacity to get to it. So, that's another major disadvantage. I suppose others could point out additional disadvantages, but those are the two key ones that I see.

Student: But the quality of the information is superior.

Hall: The quality of information is superior. Now, that is not uniformly true for every aspect that one might want to measure quality on. If I take a picture from an airplane, and I'm closer to the target, I could probably get better quality than I can from any space system that you want to imagine. But that airplane can only fly in certain weather. It can't always take off. We lose an awful lot of planned sorties every day because of weather problems at the airfield of take-off, or the airfield of recovery, or along the route.

An airplane can't see as well as a satellite. If you're working in Iraq, an airplane does pretty well because it's flat terrain. If you're working in Korea, there's a whole bunch of terrain you can't see because it's masked by the mountains. So, there's an example in terms of quality. What's more important, the resolution or the ability to see in a valley?

The other thing is that an airplane is a local asset. It's not easily tasked. If I have them all in Korea, it's hard for me to get them to Taiwan if I need them up there. In a space system, you can do it.

So, there are advantages and disadvantages to space. Overall, I think the preponderance on the quality side is on the space side across the board, but that's not to say in everything, at all times, and all circumstances.

Now, a few words about the NRO. The NRO was formed in 1961. It was a covert organization set up as a partnership between the Air Force and the CIA, and its purpose was to eliminate the competing approaches for the development of reconnaissance satellites that both organizations were pursuing, and leverage the U.S. effort in this brand new, risky, very important area by doing it through one organization. Both the Air Force and the CIA contributed to it, and the leader of the NRO has always been a senior official of the Air Force reporting both to the SECDEF and to the DCI. So, for example, I am both director of the NRO and assistant secretary of the Air Force for space. In the past, NRO directors have had positions in the Air Force either at the assistant secretary level, the under secretary level, or at the secretary of the Air Force level. About half of the directors of the NRO have been secretaries of the Air Force.

Shortly after the NRO was formed, the Navy was brought in, because the Navy was interested in ocean surveillance, ocean reconnaissance, and so forth. That basically formed the organizational predicate for the NRO throughout its first 28 years.

Without question, the NRO's experience and history show it to be a world-class organization. I know: I'm the director, so what else am I going to say? But I don't think that would be challenged by anybody. It's the premier reconnaissance organization in the world. The capabilities that it has developed in terms of acquisition, in terms of operation, in terms of performance, in terms of cost, in

terms of any of the metrics you want to place on it, show it as being clearly superior to anybody doing comparable work in other fields. The secret to that has been, as I said before, reliance on industry, rather than reliance on government. It's streamlined. The budget and the number of people in the NRO are classified, so I can't tell that to you, but suffice it to say that it is a very small group of people relative to what it is doing, and that's because 93 percent of its dollars are put on contract.

The NRO has been conditioned by several things. Over the long term, if you look from the start of the NRO out to the year 2020, I think you will see that the most significant trend that characterized the NRO in terms of its work is movement from strategic to tactical use. It gets back to the point I was making before. The gradual reduction in security associated with what it puts out, coupled with the increasing timeliness of the information available to the users, has brought about this situation.

In the 1960s very few people got to see the information that the NRO had because it was not available in a timely way. Our pictures were taken by cameras with film; the film would gather onboard the spacecraft over 30 days or 45 days; it would be jettisoned off the spacecraft, snatched out of the air by an aircraft, brought back to a photo lab where it would all be processed—thousands and thousands feet of film—and then analysts would pore over the film, some of it 45 days old, some of it a day old, and tell the President and the secretary of defense and the senior folks in Washington, "This is what the Soviets are doing. This is the number of silos. Here is a new facility that's going up. Here is where their bombers are." That type of thing. It wasn't timely, and because it wasn't timely, there were fewer people who could benefit from it, so it was strategic in nature.[2]

As the systems became more timely, and also improved in quality, the possibility of providing support to tactical operations began to emerge, but the security of it was still very, very high. So, back in the 1970s, what was developed (and it still exists) was a thing called TENCAP, which stood for tactical exploitation of national capabilities. Basically, what this said is, "These systems are really for the boys in Washington. But we can, with the right security, provide some information to a tactical user because it is a source of timely information." So, we provided a means for the military to start hooking up to it.

I foresee a period in the year 2020 where this evolution causes an exact opposite paradigm to exist: where the tactical use of this information is the dominant use because everything is timely, everything is accurate, and everything is flowing down to support tactical operations. The boys in Washington can pull off from that little snippets that they need to figure out the big strategic picture at the same time.

That's where I think space is going. The U.S. Air Force's long-term plan as of right now is called Global Engagement. What the Global Engagement vision says is that the U.S. Air Force is going to transform itself from an air force to an air and space force to a space and air force, where air is a secondary part, and space is the predominant one. They don't put a time frame on that, but that's the transition that the Air Force long-range plan envisions. The U.S. Air Force, by the way, is the other entity of the U.S. government that builds national security space systems. The Navy does a little bit, but by and large, when you're talking about national security space, you're talking about NRO and the Air Force. Of course, the Air Force is also part of the NRO, so the Air Force has its dibs on both sides, although the Air Force doesn't control the NRO. That's under the SECDEF and the DCI.

If you look at some of the evolution of what we call the "white" space side—that's the unclassified Air Force side, versus the so-called "black" space side, which is the NRO—in space-based infrared (IR) systems, you can start with a system built in the early days called DSP, the Defense Support Program. It was designed to use IR data to detect the launch of missiles from the Soviet Union against the United States, to enable us to assess that we are under attack by a missile launch, and to provide the timeliness necessary for the strategic forces of the United

[2] For background, see Albert D. Wheelon, "Corona: The First Reconnaissance Satellites," *Physics Today*, Vol. 50, No. 2, pp. 24–30, February 1997.

States to take appropriate action. You have a 30-minute flight time from the Soviet Union to the United States, or a shorter flight time if they're in submarine-based launchers off the coast of the United States; then you're talking minutes. But basically DSP was looking for a very large missile that burns very brightly and has a flight time of some length to get to the targets in the United States.

From there you get to the SBIRS, the space-based infrared system, which DOD is now building to replace it. SBIRS is aimed not only at providing warning against ICBM attack, no matter whom it's from, but also at warning of theater missile attacks, such as Scuds and all of that, which have much shorter flight times, and don't burn as brightly. There are a whole bunch of missiles in the world today that the capabilities for missile warning do not detect right now, and SBIRS is a system that will take care of that problem.

There is a good example of something that brings added benefits. If you have a surveillance-type capability to detect any missile launch anywhere in the world instantaneously, and within minutes of the launch to characterize the threat from a technical intelligence point of view, any time there's a test launch of a missile on a test range, for example, the boys in Washington will be able to get all the information, just as a byproduct of the warning system built by DOD. That's the evolution that I see across the board.

When you look at what the Department of Defense and the military want in the way of imagery, and in the way of signals intelligence, which are the things that the NRO builds, I think that, because of the advantages of space, their demands will grow to a point where they will come to drive these systems, not what the intelligence community wants from them. They'll get that just as a byproduct. I digressed a little bit and elaborated on that, but that's the transition I see occurring in the space arena through the year ... you pick it; I don't know whether this is 2010 or 2020. Right now, the intelligence community drives these space systems. At some point, I think, military use is going to drive them as the primary design objectives.

The NRO in 1990 went through some cataclysmic changes, all associated with three transitions that I want to talk about. The first was a transition where the organization moved from having separate program offices based upon the components that make up the NRO, so there was the CIA program office, an Air Force program office, and a Navy program office. A decision was made to transform from that organizational predicate to one that was based upon function—imagery intelligence, signals intelligence, R&D, and communications—and also collocate all those program offices in one place in Washington. That also was the time that the Cold War ended and basic questions were raised about whether we still need these same satellite systems, or whether we need something different. In addition, it was the period when the NRO, along with its mission, went from being a covert organization to one that was in the open and publicly acknowledged as being a part of the U.S. government.

Also at that time there were two events that are really tied to this transition, and caused the NRO significant embarrassment. One was the building in Chantilly. If you've read about that, the headquarters building of the NRO was conceived at a time when the NRO was a secret operation and only a few people down on the Hill who looked at the NRO were told about it because that's the way it worked. By the time it was occupied, we were an overt organization, and in between some members of Congress who weren't on the intelligence committee were surprised that there was this major intelligence agency in Chantilly, Virginia. So there was a big to-do about that.

The other thing was financial management. You may have read that several years ago the NRO discovered that it had billions of dollars that it had not spent. Now, I'll start off by saying that only in Washington can you get in trouble for not spending all the money in your budget. But the fact of the matter is that when we moved from being organizationally based—CIA, Navy, and Air Force, each of which executed the budget with different financial systems, and with different financial standards as to how you classified expenditures and all the rest—to one organization that was expending the funds, that's what caused the uncertainty as to our financial execution status. There was no money lost. All the money, in the end, was audited and found to be applied to purposes

authorized and appropriated by the Congress. But the NRO had just not spent all the money that it had.

It ended up that the first year of Bosnia was on the NRO. In 1996, the Department of Defense had a requirement for about $1 billion to pay the costs of going to Bosnia, and there were sufficient funds in the NRO to pay for it. But the NRO didn't know that it had that money. Otherwise, my predecessor would have been a hero, because he could have gone in the summer before and said, "Hey, Bosnia is on us." Unfortunately, he didn't know the financial status of the organization in terms of what it had executed. So it took an inspector general to tell him how much money he had. He was dismissed eventually.

Student: Was that money that was kept in financial accounts? Or was that money that was parked on contracts that just hadn't been disbursed yet?

Hall: It was money allocated to contracts that had not been disbursed, and the NRO has hundreds and hundreds of contracts. The money had been allocated and not spent for a variety of reasons. In some cases, it was for good reasons: something had changed, it didn't make sense to go on contract now, so they waited for a year. For instance, in the launch base, we had money planned to buy rockets from the Air Force to launch our satellites, and the launch plan stretched out, so "Don't buy the launch vehicle now; wait until next year." In other cases it was caused by holds placed on spending by the Congress. Congress said, "All right, we'll give you the money, but you're not allowed to spend it until you provide report X," and we'd say, "Okay." It was in part caused by money executed from others. We provided a whole bunch of money to the Air Force to execute all these launch things. The Air Force executes their money first, and funds from others second, because they want to show their execution rates as being high. So there was a piece of that.

Then, some of it had to do with the cancellation of a whole bunch of programs after the end of the Cold War. The size constellations that were predicated on spying on the Soviet Union no longer obtained, so we didn't need to buy as many satellites. Ongoing programs to acquire satellites were canceled. The NRO, as any organization would, estimated very conservatively what the termination costs on those contracts were going to be, but then did a good job negotiating lower termination costs. That generated excess cash. By the time it was all done, it was $3.8 billion excess to needs in fiscal year 1996. About $1 billion of that was taken out and used for Bosnia. The rest of it was left in the budget, and then the plan was just to request less than what we needed in fiscal year 1997 and fiscal year 1998 to eat into the mountain of cash. Some of it was rephased. Some of that $1 billion had to be paid back: it was just delayed spending where we had asked for it too early, in effect, and were going to need it later for rockets and boosters, for example.

By the time it was all done, it was about $1 billion that the NRO didn't need, because just through execution they had saved money. They did it at less than what they anticipated it was going to be, including what I mentioned on the termination liabilities. But this was a big deal in Washington, in part because, as I say in sort of a flip way, it's only in Washington can you get in trouble for not spending all your money. But the fact of the matter was that programs weren't moving forward because of the lack of money, and then the NRO had all of these dollars over here that it didn't even know it had. So there were things going wanting for the lack of money when there really was money available to pay for them if anybody had known about it.

So, that is the public persona of the NRO as it came out of the closet, so to speak: the building and the financial management disaster. It's all directly tied to this transition that it was going through, from covert to overt, and from CIA, Navy, and Air Force operating arms to an NRO operating predicate.

Student: Could you please elaborate, because I'm a little confused about the contracting system that you have. Do you mean contracting only on buying hardware and technical assistance, or really intelligence work contracting?

Hall: The NRO has what I call cradle-to-grave responsibility for satellite systems. So we do research and development, acquisition, launch (although the Air Force launches them for us, we buy the boosters for it), and operation of the system all the way through to end of life. We are not responsible for transforming the information that we collect into intelligence. So, we deliver mountains of imagery data, but we deliver that to the National Imagery and Mapping Agency and to other people around the world who then use it to provide photographic intelligence support to missions. We collect mountains of signals intelligence and deliver it to NSA, by and large. They're the ones who do the analysis exploitation reporting, although some can go directly to users in the signals intelligence domain and so forth. So, we are an intelligence agency in that we build reconnaissance satellites, but I don't produce the first bit of intelligence. I am a raw data provider, and a very high-volume raw data provider, to the intelligence community and directly to users.

When I came to the NRO on top of this financial management disaster and all of this fur, I asked Admiral Dave Jeremiah, the former vice chairman of the JCS, to come on in and take a look at the NRO and give me recommendations on what we should do for our future. (By the way, that's available on the NRO home page. One of you was showing me earlier that he had it up and was looking at it before the meeting.) The Jeremiah panel gave us several recommendations: First, our job wasn't collection of intelligence from space; it was information superiority. The organization has a large-scale system engineering track record of excellence, and that has to be applied to the information superiority business. It also has connections with industry and so forth that make us a logical choice. So we need to think of ourselves not just as delivering and dumping raw data on users; we have to look upon NRO more as an enabler of information superiority.

Second, the NRO had gotten somewhat bureaucratic during the reorganization. We needed to emphasize acquisition reform, to get back to that streamlined acquisition without all the bureaucracy. We should promote security reform. We still had overly classified activities that got in the way of getting our job done. We also needed to change our bedside manner with customers, because most of the customers didn't like us. We were hard to deal with. That's just a few of the headlines on it.

So, what are we doing about it? The first thing I'll highlight is that, as you can imagine, coming into the organization as acting director (because it took me a while to get confirmed by the Senate and be made official) right on the heels of the financial management disaster with $3.8 billion made things rather interesting. The first thing I had to do was find a balanced way of accommodating oversight, because we had auditors from everywhere crawling all over the place, and do so in a way that maintained what I said before is one of the edges that the NRO has, which is streamlined management, with a small bureaucracy. Even with the Jeremiah panel report, I assure you we are far less bureaucratic than other agencies. Again, I mention that 93 percent of our dollars are on contract; they're not in the bureaucracy.

I had to find a way to balance this outcry, this outrage, on financial management and maintain what I think has been the ability of the NRO to perform over the years, which is not following everybody's rules. We abide by the law; for example, in acquisition, we abide by the FAR, the Federal Acquisition Regulations, but there are all of the other things that get larded onto the processes. In DOD, for example, you do *this*, and you have *these* meetings and go to *this* board and get *that* approval and all the rest of that stuff, and I felt it was important to avoid that.

The way we've done that is we basically said, "Hey, we welcome the oversight. Come on in. Watch everything that we're doing. Get involved in our processes. I have my own acquisition board: USDA&T, C^3I, DCI, and all the people. You want to sit on our board, DOD space architect? Come on in, you're welcome to participate, to tell us what we're doing wrong, and to give us your ideas, but don't tell me that I have to follow your process or go to your meetings and all the rest."

This has turned out to be a successful approach. One of the more interesting outcomes of the financial management disaster is the establishment of our own bank account, which I think is unique. I don't know

whether you read the papers about just how screwed up the Defense finance and accounting system is. I mean, the Defense Department doesn't know how much money it has or how much it's spent, and that was part of our problem, too, because part of our accounting, coming through Navy and Air Force channels, was based upon that. It was time late, inaccurate, and so forth. So, we have our own bank account now. I get my own Treasury statement. I know exactly what our financial situation is on a monthly basis, and next year, I'll know about it on a daily basis—how much have we spent of the money that we got, for example. So, even with the cries about the oversight and the mismanagement and all the rest, we have been able to fashion our own unique solution. I take that as a very positive development, as opposed to what normally happens in Washington, with a whole bunch of new rules and regulations and overseers and things that slow you down being the fix that then stays on forever.

Let me talk about technology. We're going to competition. We're really applying acquisition reform. We've had folks from the Department of Defense come on out and they are now using us as a model to apply back into DOD procedures in a lot of ways in terms of how we go about an acquisition.

We're going to smaller satellites. I said before that I think that the demands of the military are going to drive NRO systems in the future, and the demands of the military are more like surveillance than they are like reconnaissance. Periodically seeing what's going on is reconnaissance; surveillance is watching what's going on all the time. In order for the NRO to do that, we have to have more satellites. In order to have more satellites, we have to bring down the costs of those satellites, and the way you do that is to go smaller. Technology is on our side. We can build very, very capable satellites now in much smaller packages, which means we can launch them with much smaller launch vehicles, which also saves us money. We can maybe even get into a manufacturing type of approach to a satellite as opposed to a craft type of approach. Today, these satellites are lovingly made by hand. If we can get to a manufacturing approach, such as you see in the commercial industry (for example, Iridium Satellites is stamping them things out one a week), we can really save money and deploy more satellites to get towards that surveillance objective.

We have emphasized revolutionary versus evolutionary. For a while there in the post-Cold War era, we went through what I call a period of adjusting Cold War systems to meet post-Cold War requirements, and that involves improvements to existing satellites. We now have said, "Well, it always makes sense constantly to be looking for ways to improve, but there is sort of a limit to what you can deliver to a customer from that perspective." We're now looking for "leapfrog" capabilities. In order to support that, we have significantly expanded our R&D budget. When I got there in 1996, I set the goal that I wanted to move our R&D from 4 percent of our budget to 10 percent of our budget by the year 2000. We'll hit 8 percent of the budget in the proposal we're submitting to the President right now to give to the Congress for fiscal year 1999, and we'll hit the 10 percent objective in 2000, just as I said. That's more than doubling our allocation resources to R&D.

For the reasons I specified before about where DOD and everything are going in space, and the importance of that, Air Force/NRO partnership is absolutely critical. We have the two agencies, the two entities, in the U.S. government to build national security satellite systems, and we need to do this together. In the past, the relationship between the Air Force and the NRO has been characterized by trust and confidence: they didn't trust us; we had no confidence in them. We're seeking to change that. A lot of social issues have to get worked. We have agreement at the top that that's going to happen. There is still the concrete layer down below us on both sides that says it's never going to work, where you have the CIA guy saying, "The Air Force is going to take over the NRO." So, there's all sorts of stuff. But I think that is the key to information superiority, to the extent that space is the place from which information superiority will largely be provided, at least in terms of sensors, command and control systems, communications, navigation, weather, and all the rest of that.

Student: Do you see CINCSPACE playing that part? It could be the melder of all the organizations, but that would be basically subordinating NRO to CINCSPACE. It would be a totally different organizational structure. It wouldn't be service/DOD oriented. It would be CINC oriented.

Hall: If there were ever a merger along the lines of CINCSPACE being in charge of everything, I think you are talking about a very different type of role for CINCSPACE than it has today. CINCSPACE, like every other CINC (with the exception of Special Operations Command), really has no resources and acquisition. It doesn't control any resources. It's all executed by the services. The NRO is an acquisition organization and an R&D organization as much as it is an operations organization. Twenty-two percent of my budget goes to operations, which means that 78 percent is doing something else. The thing that CINCs concern themselves with is operations.

Student: Isn't that along the lines of what the NDP is sort of recommending, though?

Hall: I'm not sure that's the endpoint they had in mind. You mean, like the CINC taking over acquisition responsibility?

Student: They really talk about the whole C^3I effort going to CINCSPACE. They didn't make clear acquisition or anything else, but they're easily separable.

Hall: They're talking about having a CINC that's responsible for the operational architecture—either CINCSPACE or some other CINC, ACOM (Atlantic Command) or something. I agree. I talked before about operational architectures, system architectures, and technical architectures. Right now, operational architectures, in effect, are in the hands of the CINCs when they can be, and that's appropriate. I don't think I should be designing operational architectures. I think the assignment of system architectures or technical architectures to CINCs is technically feasible, but they're not resource outfitted, nor do they have the expertise to do that.

Student: When they did that with TRANSCOM, they chose not to put the acquisition and the R&D part under the CINC, but they gave them a very, very strong voice in what those organizations were going to do by guiding them through the military budget. So the transportation research people down in Tennessee and all the other folks who do the R&D are still the acquisition organizations they were before, because they just couldn't come up with a way to make it work.

Hall: I'll tell you, I think that demonstrably (and there are probably a lot of other reasons, not the least of which is that it was a covert organization for a long time and didn't generate all the amount of oversight that can get in the way of progress) an NRO type of arrangement for space would be very effective. I'm not saying there has to be an NRO, but an NRO type of arrangement: that is, an organization that has responsibility, cradle to grave, for space systems. If one wanted to call that organization across all DOD space CINCSPACE, and put a four-star in charge of it, I think that would be fine ... eventually. Obviously, some accommodation would have to be made with the DCI.

The point at which we are ready for something like that, though, is not now or any time soon, because right now, if you count the money being spent in national security space, it is overwhelmingly on the DCI side of the house. The military hasn't yet embraced space as something important. Only the DCI has embraced it as something important where he's prepared to put resources into it.

If Global Engagement, the Air Force vision, really comes to fruition, then that's going to mean more and more dollars being put on space by the Department of Defense. Of course, in the Air Force, they're talking about transitioning missions from air to space in all domains, from ISR to command and control to, eventually, all sorts of things. If that happens, then what I am predicting has occurred: the military is dominating the design, operation, and application of these space systems. The NRO plays a unique role in that it collects large volumes of different types of data. I think that its system engineering skills and its connection to the industrial base in Amer-

ica provide a wherewithal to pull together a system of systems that allows for the development of what I think the users want. That includes one-stop shopping, as I described before; the ability to interact with an information source that tells them everything that they need to know—blue force status, red force status, weather, and so on and so forth. If we approach it from a system engineering point of view across the data sets that we have, and if we can partner with the Air Force, we've got 80 percent of the problems solved, and if we build it, they will come.

So that is the other thing we are spending resources and time on, particularly with this increase in R&D. The NRO has to do that, because otherwise I have volumes of data that aren't being used, and that is a path towards becoming irrelevant. Do we have time for a few more questions?

Student: Is there any increase in concern about the fragility of your systems, or is more money being put into hardening or countermeasures or some other thing?

Hall: Yes, there is concern. I can't say that there's a lot of money going into buttoning up any vulnerabilities that exist. First of all, I don't think we see it as a near-term problem. It's really longer term. The Soviets used to have a very robust program on antisatellite capability and going after space systems and all the rest, so this isn't anything new, although that sort of diminished in the post-Cold War world, obviously. What usually happens is that the dollars required to harden (if you will) the satellites compete with dollars that can be used to improve their capabilities and performance. When you bring that to users, they usually trade in favor of taking the added risk and going with improved performance. It's going to be really interesting to see what those trades are like in the future. But there's no doubt that the United States relies on, and depends on, space systems. That should make them an attractive target for any adversary, and, therefore, it is a source of concern in terms of defense of the systems.

Oettinger: I hate to cut this off, but I've got a commitment to getting Keith on his air-breathing vehicle back to Washington. I want to thank you very much and give you a small token of our large appreciation.

Hall: Thank you. I always enjoy this. As I said, it's a lot more intellectually stimulating here than it is in Washington.

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