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The Commission to Assess U.S. National Security Space Management and Organizations
Thomas S. Moorman, Jr.

Guest Presentations, Spring 2001
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The Commission to Assess U.S. National Security Space Management and Organization

Thomas S. Moorman, Jr.

April 26, 2001

General Thomas S. Moorman, Jr. (USAF, retired), is currently a partner in the international management and consulting firm of Booz·Allen & Hamilton, where he is responsible for both overseeing the firm's government-space business and managing the firm's support to the U.S. Air Force. In addition, he recently participated in several special study groups related to space. He served for thirty-five years in the Air Force, beginning with a variety of intelligence and reconnaissance-related positions. His association with national security space programs started in 1970 and has continued for the remainder of his career. Among his more notable assignments have been deputy military assistant to the secretary of the Air Force; vice commander of the 1st Space Wing; director of space systems, Office of the Secretary of the Air Force; director of space and strategic defense initiative programs; and vice commander and commander of Air Force Space Command. In addition, he led a major study to recommend a course of action to modernize the nation's space launch capability. His last military assignment was as vice chief of staff, U.S. Air Force. He has received numerous awards for contributions to the nation's space programs and has been recognized by the intelligence community with the award of the National Intelligence Distinguished Service Medal with one oak leaf cluster, the Defense Intelligence Director's Award, and the National Reconnaissance Office [NRO] Gold Medal. He received a bachelor's degree in history and political science from Dartmouth College, a master's degree in business administration from Western New England College, and another master's degree in political science from Auburn University.

Oettinger: I won't give you a long introduction to General Moorman, because you have all read his biography. He has a presentation, the beginning of which is on the screen, but he has also indicated he's happy to respond to questions as he goes along. With that, I turn it over to General Moorman. We're delighted to have you with us today.

Moorman: Good afternoon. The subject of my talk here is "The Commission to Assess U.S. National Security Space Management and Organization." That's the formal title bestowed by Congress on the commission that has come to be known as the Rumsfeld Space Commission. This is a pitch that we developed and have used around Washington and environs, on the Hill and whatnot, and I'm going to stick to it a bit. As far as I'm concerned, the rules of engagement are that this is a classroom environment. I will talk about anything you want to talk about, consistent with classification.

Oettinger: I have promised General Moorman that you all understand that nothing that happens here is for attribution.

Moorman: I want to say a couple of words to put the Commission's work into the context of the sweep of history and policy. I'll talk a lot about what appear to be strictly organizational or management issues, but the significance of this is far greater. I don't mean these statements to be self-serving, because I served on this commission.

The importance of space to our national security has always been pretty significant. It has expanded substantially since Desert Storm, to the extent that if you look at the current vision documents in the U.S. military—whether *Joint Vision 2020*, *Army After Next*, *From the Sea* for the Navy, or *Global Engagement* for the Air Force—they all begin with the premise of information superiority. Information superiority is enabled through the space program. In a broad vision and policy sense, I put space into that kind of context.

Second, in a policy sense, is that most of us who work in this business believe that the traditional four space sectors—military, intelligence, civil, and commercial—are becoming less distinct. I think you full well understand the military and the intelligence sectors. The civil sector that I'm talking about include NASA [National Aeronautics and Space Administration], the Department of Commerce, the Department of Transportation, and the Department of State. The commercial sector is the burgeoning space industry. If you think in terms of a Venn diagram, those four sectors, which were created independently, and by law mandated almost to operate independently in the early days, are converging rapidly. So, although the emphasis is on national security, you can't talk about space just in that context.

Third, from a policy or an academic point of view, is that this study was directed to look at the creation of a fifth service: a service for space. Just to put that into context, there have been no studies to look at a new service since 1947.

Fourth, as all of you know if you're reading the newspapers, this new administration is undertaking a major national security review. There are some twenty-one studies going on in the Pentagon as we speak, and we should see its rollout probably in the first part of May, when Secretary Rumsfeld has his posture hearing. The report by the Space Commission was published in early January and influences that process by definition.[1]

The final thing I want to say is that most of the studies I have dealt with over twenty years gathered dust somewhere. What makes this one different is that our chairman is now the secretary of defense, and in his confirmation hearings he drew on this presentation fairly heavily. Space information, command and control, and intelligence were all high priorities that he thought were going to be important in his administration. These preliminary remarks were meant to be the come-on to you as to why I think this is a pretty significant piece of work that has a lot of legs and a lot of influence.

This is a NASA picture, and if you look closely, the little white dots are objects in space (**Figure 1**). NASA's Space Debris Office provided us with this. There's a message there: that space is getting crowded in some orbital regimes. It is a cartoon, but it is based on a computer

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[1]See *Report of the Commission to Assess United States National Security Space Management and Organization*, [On-line]. URL: http://www.defenselink.mil/pubs/space20010111.html

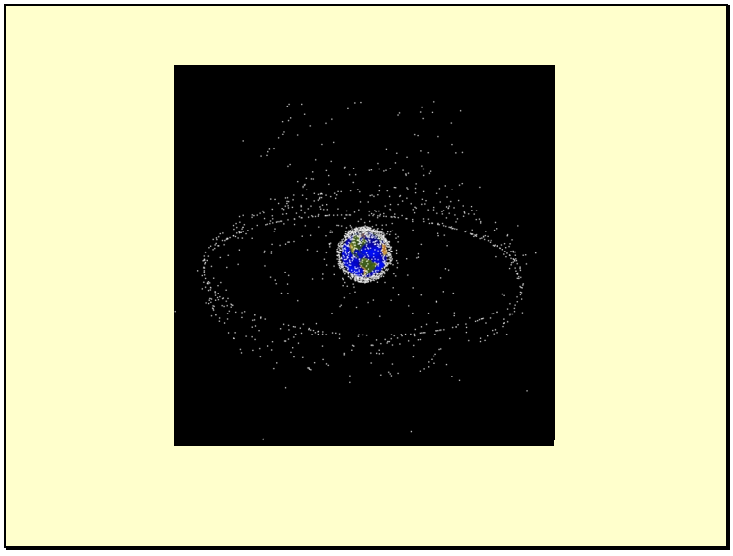

Figure 1

simulation. These positions are actual. Obviously, we didn't have a photographer out there, but this is pretty accurate.

This is the Commission's mandate, and I think it's important to understand it (**Figure 2**). This study came about as the result of congressional criticism of the stewardship of the national security space program. A lot of it was directed at my service; I was formerly in the Air Force. In general, a few senators on the Senate Armed Services Committee felt we (the national security community) weren't paying enough attention to this mission area. So the mandate includes assessing possible long-, medium-, and short-term changes that could strengthen national security space, including enhancing space support to military operations (that's the interagency

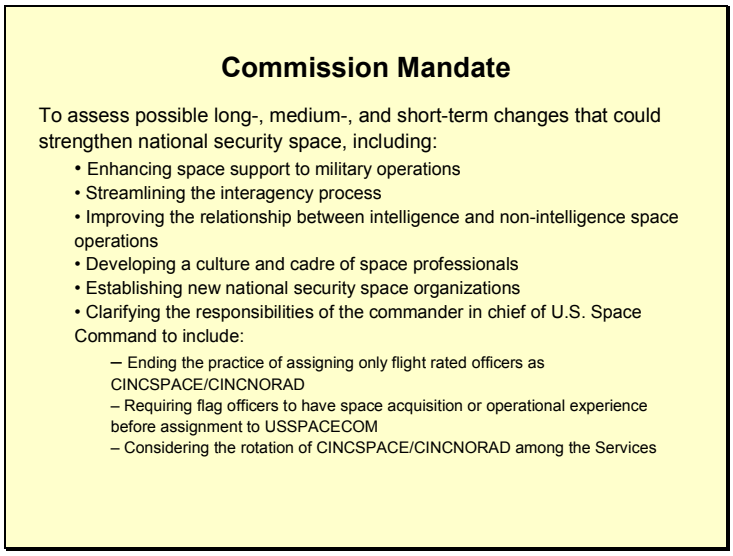

Figure 2

process—I'll come back to that); streamlining the interagency process; and improving the relationship between intelligence (read: the NRO) and nonintelligence space operations. There is very significant interest in developing so-called space professionals or space warriors.

I'm going to stop for a minute with "establishing new national security space organizations" to describe what the tasking was, in law, what they were asking us to look at. We were asked to look at a separate service for space, a Space Corps, analogous to the Marine Corps; a kind of equivalent to a Space Defense Agency, one that could conceivably be managed on the third floor of the Pentagon, and then a separate funding arrangement for space. In the parlance of the Defense Department, that funding arrangement goes by something called the Major Force Program.[2] That is unusually explicit direction, in my experience.

Oettinger: Let me put this in a deliberately provocative way, partly to stimulate the class and partly to provoke a response from you. As I look at this, I'm reminded of some other views coming from, let's say, the National Security Council [NSC], or the civilian side, that would see this as a rationale to enhance the relative share of military operations at the expense of the strategic, the National Command Authorities [NCA], the White House, et cetera, by essentially taking over for support to military operations resources such as the NRO that were at one time the monopoly of the strategic and civilian and so forth. Clearly, there's a problem of allocation.

What also struck me as significant, which is not here, is that it was stimulated by the Armed Services Committee, which is not the same as, and is often at loggerheads with, the select committees on intelligence, so there's a congressional schism there as well. Am I raving out of whole cloth, or is there something there that is worth enlightening the class on?

Moorman: It is ten after two, we're on the introduction, and this an incredibly good question. I'm not a slave to finishing this pitch, because this is a public policy kind of class. I believe that what Dr. Oettinger pointed out is very accurate, and I'll paraphrase his question to answer it. He said, "Your tasking was by the Armed Services Committee, whose purview is the armed services. There is also a corresponding, and sometimes competing (in a budget sense), intelligence structure. There is a science and technology structure, etc., in the oversight process."

What I interpret Dr. Oettinger's question to be is the classical national-tactical debate on space resources. I will explain that a bit. I happen to believe those distinctions are not nearly as relevant as they once were, but conventional wisdom, if there ever was such a thing in this domain, says "national" means you support inside-the-Beltway kinds of decisionmaking—that is, the White House, the NCA, the State Department, and the like—and you by and large look at technical intelligence issues or issues that support presidential decision processes. "Tactical" is support to military operations. Quite honestly, if I'm only thinking intelligence, for the first twenty-five years the resources of the intelligence and strategic warning sides of space were oriented toward the national side.

Two phenomena occurred within two years of each other that changed the equation. One was the Berlin Wall coming down. The monolithic Soviet Union, against which all this intelligence collection, strategic warning, and surveillance business was entered into, went away, and with it that huge threat. The second thing was the "first space war"—Desert Storm—wherein we employed all these space resources originally created to serve national needs as tactical assets.

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[2]See pages 23–24 for a discussion of Major Force Programs.

There was another phenomenon. Once the NRO lost the bipartisan support for a lot of this activity, which was based on the nuclear threat and the Russian bear (the Sino–Soviet threat, really), then the intelligence community had to turn to the military for its support. When it did so, the military, as you might gather, would ask, "What have you done for me lately? I want downlinks of this stuff to my people. I want to start helping you design these things." I'm building you a clock when you asked for the time, but you could argue that the curve of support has almost been vertical, and you could argue that this tasking is a continuation of the same trend. I will come back to this in one of our recommendations.

Oettinger: It was just worth emphasizing, because those of you in the military are going to walk into the middle of this. It is a continuing controversy in your occupation.

Moorman: We have a CINC [commander in chief] for space [CINCSPACE]. There are some extraordinarily detailed issues that have to do with cultural things, and they get back to "developing a culture and cadre of space professionals."

Let me give you a philosophical comment. If you believe that space is the next high frontier, and that it may become a theater of conflict, then you start worrying about having the right kind of organizations to develop systems and to train space warriors for the future and if you'll be ready for that future. The people who drafted this language clearly believed that.

Student: Would this new group be a Space Corps, like the Marine Corps? A Space Force, like the Air Force? A whole new branch of the military?

Moorman: We looked at all of the above. The first option was a separate service, like a Space Force. We also looked at a Space Corps. As you well know, the Marine Corps is now under the Department of the Navy. There are two models, and I could hold forth for hours on this subject and bore you within ten minutes. There are two models for a corps: one is the Army Air Corps during World War II, and the other is today's Marine Corps. It could be either of those.

Here is the Commission membership (**Figure 3**). To reinforce Dr. Oettinger's point, you can see a lot of retired generals like me. We had four Air Force retired four-stars, one Navy retired four-star, one Army retired four-star, and one Army three-star. Then we had a former science advisor to President Reagan, a former deputy administrator of NASA, a former assistant secretary of defense for command, control, communications, and intelligence [ASD C3I] who has lectured at this school, a former congressional staffer and deputy under secretary of defense for space, a former congressional staffer in the Armed Services Committee, and a former senator from Wyoming, Malcolm Wallop, who by the way is a long-time supporter of missile defense. The staff director was a guy named Steve Cambone, who has just been announced for a fairly significant position on the policy side of the Office of the Secretary of Defense.[3]

We began this study in July 2000, and we reported on January 11, 2001. Mr. Rumsfeld was the chairman for 90 percent of the time. As I mentioned to you, I have served on a *lot* of study groups. This one was the most intense for people of this seniority. We met thirty-two times in six months, often in twelve-hour sessions. Mr. Rumsfeld came to every session with a written agenda of what he wanted to accomplish. One of the messages I would give to you is that some chairmen

[3]In July 2001, Dr. Cambone became principal deputy under secretary of defense (policy).

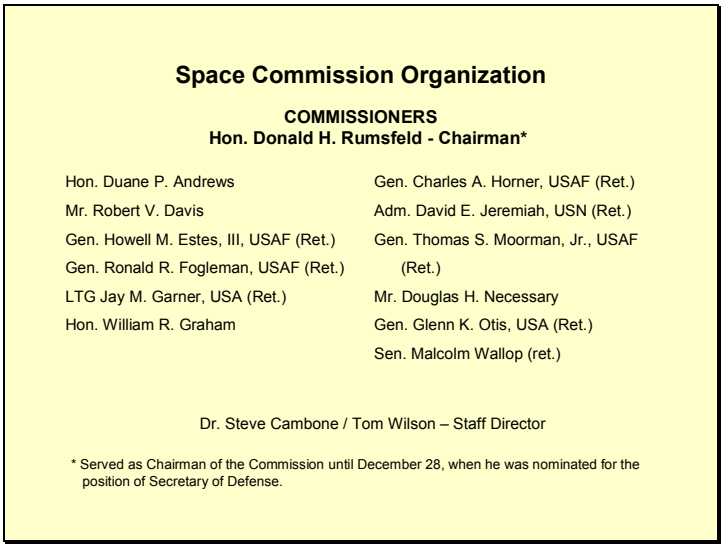

Figure 3

of these kinds of things are titular. He was anything but titular. He was deeply involved and had a deep, comprehensive understanding of the issues.

Student: That senator may pack a wallop, but you know what they say on the committee: "He's not necessary."

Moorman: I'm going to give you some thematics, because, at the pace at which I'm briefing, we probably will not get there, and I want to leave these with you. This is my slide, not the Commission's slide (**Figure 4**).

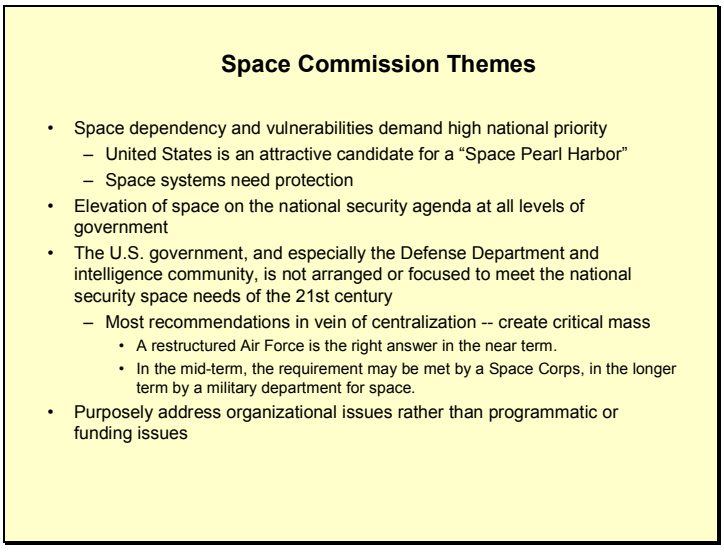

Figure 4

The first statement means that our dependency on space and the associated vulnerabilities demand a higher national priority than space has enjoyed. The sub-bullet has created quite a lot of

press, as you can imagine. What that speaks to is that this country is extraordinarily dependent on space. With that dependency, we also have extraordinary vulnerabilities. Therefore, interdicting space (and I'm not necessarily just talking satellites—it could be ground stations or launch capabilities) is an attractive option for someone using an asymmetrical activity, and the impact would be significant because we are so dependent. Hence, the catchy bumper sticker is a "Space Pearl Harbor."

Oettinger: Put yourself in the place of a congressional committee or somebody from the NSC or the Executive Office of the President. You look at that, and you also look at a report from, let's say, the intelligence community on cyberspace, or from some other communities, and they all predict that the next Pearl Harbor will be in their arena. What do you do? How do you arrive at some decision? Stop right there if it takes you too far off the track, but there's a decision layer here that is going to have a hell of a hard time deciding anything.

Moorman: Ultimately, this is a battle for resources, attention, and priorities.

Student: When you talk about a Space Pearl Harbor, it's a nice phrase, but what does it really mean? At Pearl Harbor, we lost our whole fleet, and we had military forces that were removed from the table. You're talking about a capacity for intelligence being lost, but not about forces themselves being lost.

Moorman: You're talking about forces, too. If someone were to interdict or jam the Global Positioning System [GPS] in the theater, all the weapons that are now based upon GPS guidance will go awry. The airplane makes no difference anymore.

Student: What I was trying to say was that the interdiction would affect the capacity to use the forces, versus the force itself.

Moorman: With all due respect, I would say that's the conventional wisdom, or "old think." What that says is that space systems are not force structure, and I would maintain that if they are so organic to the military way of fighting and you can't perform certain tasks because you've become dependent on them, they might as well be a battleship off Ford Island.

Student: Aren't they organic to the way we *want to* conduct warfare?

Moorman: No, they are organic to the way we do it now. GPS is a classic example. I can jam GPS satellites today theaterwide, and I can do it in such a proliferated manner that your conventional wisdom answer, which is "If the guy stays up long enough I'll kill him with a HARM [high-speed anti-radar missile] or something," is no longer valid.

Student: I just don't see it as quite a Pearl Harbor.

Moorman: You and I could debate the vulnerability. I will take your point, but I guess I would argue forever that it's not what we hope to achieve; it is what's happening today. Trust me when I tell you that dependency shuts you down in a lot of ways. I'll give you a classic example of a fourth-order satellite that had huge economic impact. About five years ago, a satellite called Galaxy-4 malfunctioned. If I had to list the top 150 satellites, Galaxy-4 wouldn't be in the top 50 in terms of the importance of stuff that goes through it. It made headlines for two months. Why? Because a very large proportion of credit card transactions and a lot of paging went through it.

My only point is, trust me when I tell you about our dependency, and trust me when I tell you about our vulnerability.

The reason it's such an interesting asymmetrical strategy is that jamming can be extraordinarily ambiguous. The jamming example is not ambiguous, but there's a huge overlap between information operations and space in terms of the threat business, and we don't have the intelligence resources to characterize the threat.

Student: I don't mean to suggest we are not so vulnerable that we wouldn't lose significant capacity and capability to conduct warfare as we wish to conduct it. I think when you talk about hemispheric loss of control and land masses and countries being overrun and occupied as a direct result of the loss of naval capacity at Pearl Harbor, it's a different order of magnitude. That's my only reason for suggesting Pearl Harbor is not the best analogy.

Moorman: Now I think I understand what you're saying. I am not talking in terms of the scope of the loss from the actual attack on Pearl Harbor. What I'm talking about is that we all believed that Pearl Harbor couldn't happen. We all wanted to explain away that particular vulnerability: that we had all our assets unprotected.

You're in an academic environment, so let me give you a suggestion. Read Thomas Schelling on the ability of public policy or decisionmakers to explain away things they don't want to deal with and the vulnerabilities that it creates.[4] This terminology comes straight out of that kind of business. "Pearl Harbor" does not refer to the scope, but to the surprise. It is the change in things that no one anticipated, even though, by the way, there were signals for years. That's another aspect here. People have been talking since Dr. Oettinger was in the NSC about space vulnerabilities and the crucial impacts that would have. This is not "new news." This is fifteen- to twenty-year-old news.

Student: What is our national policy on denying GPS? As I understand it, most of the satellites are ours, but it's used worldwide and it is becoming a standard for federal aviation.

Moorman: That's an excellent question. All the satellites are ours. I'm a little dated, but Vice President Gore signed a national security memo or something about doing away with a thing called selective availability, which was the degrading of the accuracy of the navigational signal by an order of magnitude. That was to take place in the year 2000. We actually did it earlier, because continuing to employ selective availability didn't make sense. The commercial use of GPS was so much more significant than the military use in terms of scale. That same directive out of the Office of Science and Technology Policy told the Defense Department to deal with vulnerabilities and denial of other people's use of it in a military sense. Those studies are ongoing. That's about all I'm going to say about that.

Student: Would it be fair to say, in your estimation, that with the types of units we have now, we might as well be writing them off as effective units if we take away their support from space?

Moorman: For certain units, yes. You're back to bombing in Vietnam.

Student: Which was very ineffective.

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[4]See, for example, Thomas C. Schelling, *Arms and Influence* (New Haven, Conn., and London: Yale University Press, 1966).

Moorman: Another major thematic—and, remember, the tasking was organization and management—was the elevation of the level at which space is considered on the national agenda. The recommendations that you will see in the report all deal with that.

You won't be surprised that when you get people to look at an organizational issue for six months, they're going to find things wrong with the organization. That's what the next bullet speaks to. I don't say that in a cavalier sense, but you would be surprised if you didn't have a conclusion like that from a group that focused on organization and management.

The sub-bullet is pretty important. The recommendations of the report are almost all in the vein of centralization, and they speak to critical mass. What I mean by that is that the Commission believed that the space business was far too decentralized and, therefore, far too unfocused. If I go back to that tasking we had to look at a Space Service, a Space Corps, or a Space Agency, where we came down was that in the near term a restructured Air Force is the right answer, and I'll tell you what that means as we go along. In the mid-term, you might very well go to a Space Corps, and in the future you might have a military department or a service. Our belief was that a space service might occur as the result of an external event, or a series of events or threats.

The last point is very important. In Washington, people are more interested in budgets than in organization, and a lot of people wanted this group to come out with a clarion call for funding certain kinds of force structure: satellites or whatever. Mr. Rumsfeld said, "I'm not going to do that. If you're not organized properly, and you don't have a good process to determine priorities, then you may not be making the right decisions or achieving the necessary efficiency. Once you reorganize, then come back and ask for increases in the budgets." You will not see in this report a detailed call for certain kinds of capabilities. We do include some general calls for capability.

These are the objectives that we hoped to achieve through improvements in organization and management (**Figure 5**). With regard to the third objective, we were fairly critical of the interagency process used in the last ten years as it applied to space.

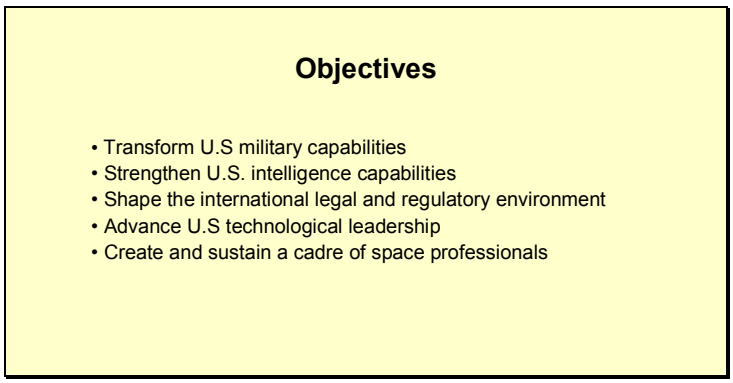

Figure 5

Previous administrations had mechanisms to deal with interagency issues in space, and, remember, when you have a space issue, it affects all four of the sectors I mentioned. I'll give you an example that really hit home to me, because I watched it unfold. I understand we had to have President Clinton intercede to influence foreign leaders, because we had not planned on something. Every two years there is something called the World Radio Conference [WRC;

previously the World Administrative Radio Conference] under the International Telecommunications Union. You say, "Why is this guy telling us stuff like that?" The significance here is that these are the guys who worry about orbital slots and frequencies. At the WRC about four years ago the United States came within a hair's breadth of losing the frequencies for GPS, because it's an international forum. It's almost like the United Nations: one nation, one vote. The Third World countries voted for using those frequencies for commercial communications satellites. If we'd lost those, there would have been a huge impact. We might as well have taken away the follow-on capability. We weren't prepared properly to understand the implications. There are innumerable other examples.

The Commission was also concerned with our eroding technological capability in this respect: the aerospace industrial base is really being transformed, and it is really hurting. You can't get talent in that business the way you once could. As you might gather, given where you go to school and where you live, dot-coms and other kinds of industries (dot-coms are maybe not the best example today) are attracting the best and brightest technical talent, not the aerospace industry.

Student: Is it just the war for talent? John Glenn spoke at the Kennedy School earlier this year, and he reached back to the national education system to address that.

Moorman: We addressed that, too. You'll see a recommendation that deals with it. For my employer, Booz·Allen, I did a study on the national industrial base and ended up briefing the Space Commission as a member. In a financial sense, from the perspective of the stock market and balance sheet, the health of the space industry is deteriorating.

The Commission's first finding, as you might gather, is that, given the dependence and the vulnerabilities, there has to be national interest at a higher level (**Figure 6**). It starts with the president. If you have a chairman who is a former secretary of defense and a former chief of staff

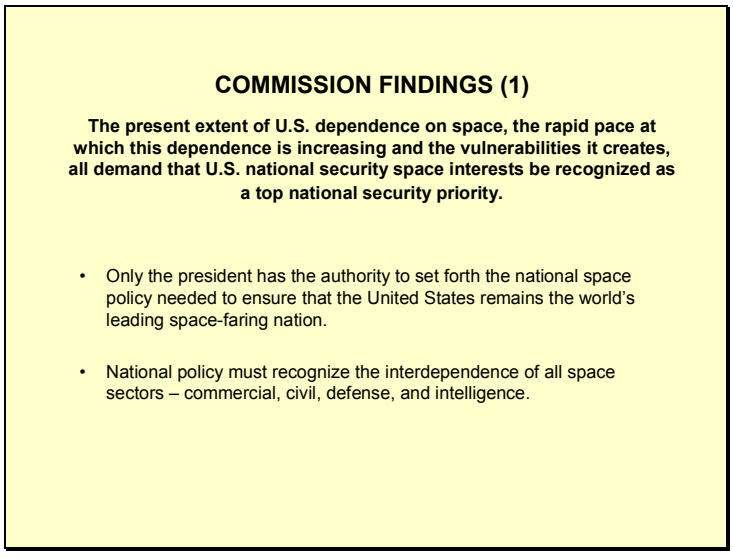

Figure 6

for the White House, his mindset begins with the president. From your perspective, what I think this results in is a cry for the president to produce a decision directive, or whatever President Bush is calling them, on space. This isn't all that extraordinary, because every president since Eisenhower has had a national space policy. In fact, Reagan had two. The reason for the two was that in the middle of his administration there were two events that fundamentally changed things. One was the *Challenger* disaster [January 26, 1986], and the other was the Star Wars speech [March 23, 1983]. Another factor was the impetus or pressure for commercial satellite communications. So the only thing I can say here is that I believe you can anticipate a space policy out of the Bush administration.

The next slide shows the findings on organization (**Figure 7**). I'll just ask you to read these bullets.

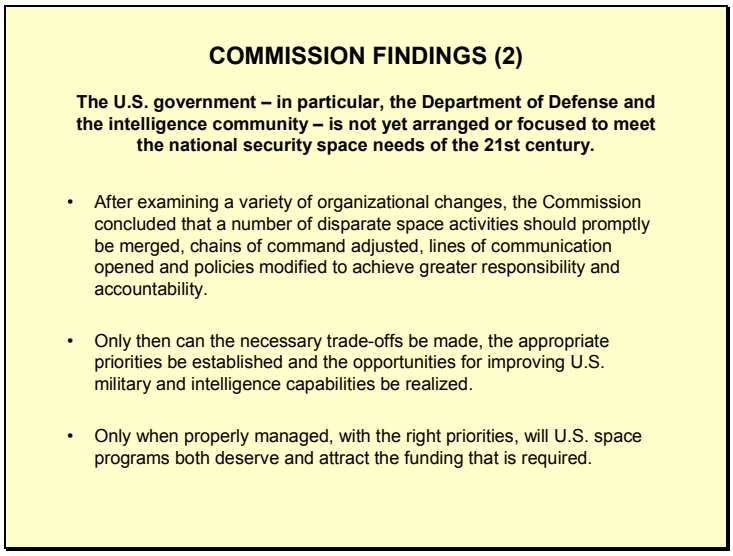

Figure 7

Oettinger: This may be an unfair statement, but the last time I read something that looked like this, what came out of it was NIMA [National Imagery and Mapping Agency], which is not highly regarded as a centralizing organization but is, instead, more like a conglomeration of agencies that are geographically, spiritually, and otherwise disparate, and nothing seems to have happened. I presume the commissioners had something else in mind.

Moorman: You pose that in an interesting way. You gave the example of a very dysfunctional organization and said, "Would you do something as stupid as that?"

Oettinger: It did sound a bit like "when did you stop beating your wife?"

Moorman: Yes, over time we had created a dysfunctional organization of geographically separated people and cultures. Let me hold that off for a minute.

This is just an example of an eye chart that you can't read (**Figure 8**). When you say "the space community," it includes all these kinds of organizations, and there are lot of people involved.

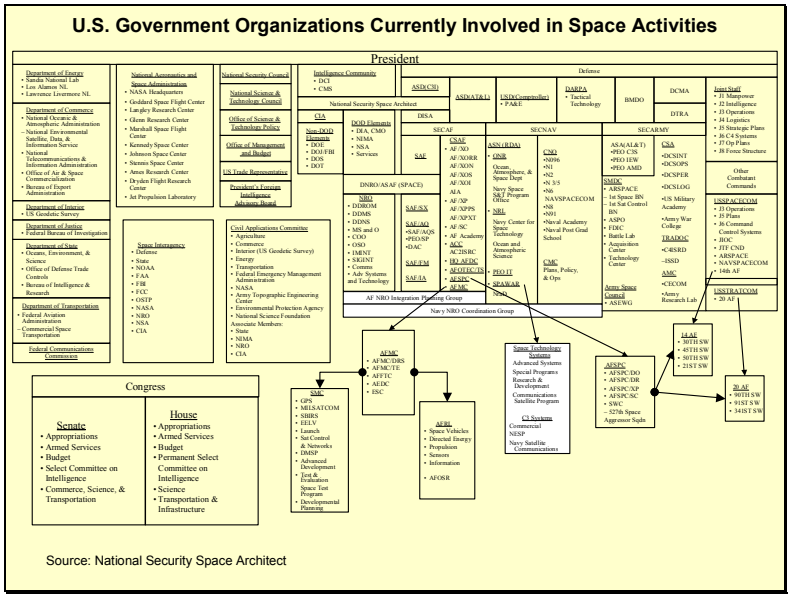

Figure 8

Oettinger: Let me interject that I worked with the Office of Manned Space Flight back in the Apollo days and was sent around the country to a number of NASA installations. It dawned on me that the moon vehicles were going to be launched from Cape Canaveral, controlled out of Houston, and manufactured in California, et cetera. Did it make sense? My boss pulled out of his desk drawer a list of the members of the Space Committee under Vice President Lyndon Johnson, and the correspondence was 100 percent.

Moorman: This [Fig. 8] isn't a map of the United States. It is the federal bureaucracy and the four space sectors. (I showed you those four sectors, and I tried to make this a different cut. These are the bureaucracies that administer those programs.) You're quite right. I could show you any NASA program, such as the Space Station or anything else, and it has exactly the same setup. I'll turn you around and show you the B-2 or the F-22 for the Air Force. We say in the Air Force, "Portions of the F-22 are built in every state in the Union." It's not necessarily that it's the most efficient way of doing it, but we're looking for congressional support. I don't fault NASA or the Air Force. So you're quite right.

I have given you this god-awful complex chart, but the next one is a very streamlined slide that doesn't come anywhere near touching the previous chart (**Figure 9**). Space activities are still tremendously decentralized. We focused on a couple of fundamental areas, primarily the Department of Defense and, to a lesser extent, the intelligence community.

This is very interesting (**Figure 10**). Just read the top, and then I'll interpret this for you. For this group, this is fairly important. The commissioners were concerned that, at the end of the day, this finding would be perceived not as organization and management but, rather, as a call for weapons in space. So, to steal a march and deal with the issue before it came out and got spun, we considered it in one of our findings. By the way, interestingly enough, when people started to

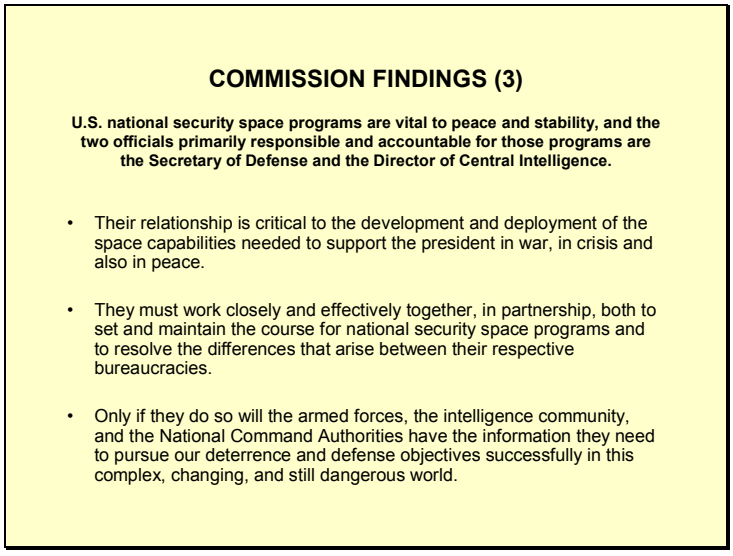

Figure 9

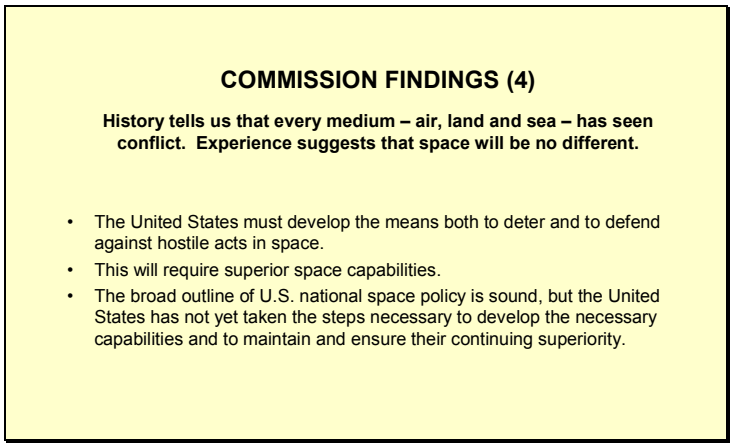

Figure 10

speculate about the results of the study before it was ever published, there were two articles in *The Washington Post* regarding the Commission, and that's all they talked about: weapons in space.[5]

What this really means is that, in the view of the Commission, every medium has seen conflict, and experience suggests that space will be no different, because it is a center of gravity. It is a vulnerability, and the United States happens to be the most vulnerable. I happen to believe it, not just because I'm prior military, but because to me it's just human nature. To us commissioners, the real point is to emphasize deterrence and defense. We're far too vulnerable, and we ought to spend a lot more time worrying about the threats and how we protect against

[5]Walter Pincus, "From Missile Defense to a Space Arms Race? Rumsfeld's Support of Satellite Attack and Defense Could Fuel Global Debate on Military's Reach," *The Washington Post*, Dec. 30, 2000, A-2; and "Rumsfeld Panel to Propose Councils to Safeguard Satellites," *The Washington Post*, Jan. 9, 2001, A-24.

them than we have. For fifteen years, the engineers have been king, and because survivability systems to protect vulnerabilities normally require decisions about cost, real estate, and power that represent budget, we have not built any survivability capabilities into our space systems—using "space systems" to include launch systems and ground systems for satellites.

This is the question we talked about regarding the industrial base (**Figure 11**). The wording here is pretty important. I think you're going to see it reflected in Mr. Rumsfeld's policies. "Investment in science and technology—not just facilities, but people—is essential if the United States is going to remain the world's leading spacefaring nation." That's an interesting statement.

Figure 11

The first bullet is actually is a significant statement in a policy sense. The operative words are "the government needs to play an active, deliberate role."

Oettinger: It's interesting that the last time those words were used, not accidentally, was in 1957, immediately after the launch of Sputnik, and what followed was a decade of unprecedented spending on research and development.

Moorman: Dr. Oettinger is exactly right. Over time, the share of the defense budget dealing with enabling science and technology has decreased, and the share of industry's attention to that has also decreased. This says that we must reverse that trend. It's one thing to talk budget; the other thing is people. As I said before, we're not training the people, and we're not able to recruit and retain them.

Oettinger: Let me reinforce that. I chair the board of visitors of the Joint Military Intelligence College, and there is hardly anything on technology in that curriculum. Beating up on folks to take that seriously has been enormously difficult, but this is essential.

Moorman: Now we're making the transition from findings to recommendations (**Figure 12**). You've seen that before: "Should consider establishing space as a national security priority." You may say, "Gee, that sounds kind of wishy-washy." Mr. Rumsfeld was quick to tell us, "You don't say 'The president *will*….'" The convention for commissions is to say "should consider." Everything else is presumptuous or insulting. Actually, you can read this as "must." I think the manifestation is that you're going to see a presidential directive on this.

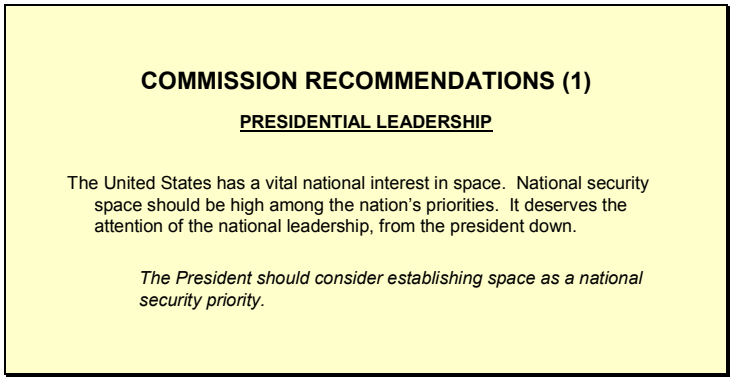

Figure 12

This is interesting, particularly with Dr. Oettinger being here (**Figure 13**). Have you talked about PFIAB in this group—the President's Foreign Intelligence Advisory Board? I don't see too many nods, so I'll give you my version. I've dealt with them for thirty years, and they've been around longer than that. This is a group of independent, highly renowned, highly competent individuals…

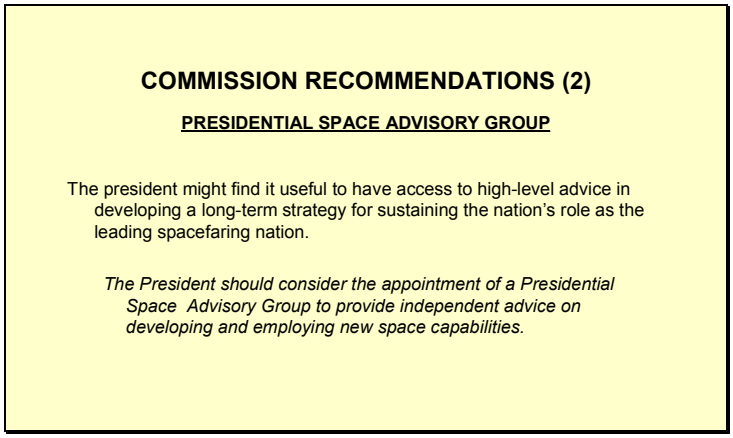

Figure 13

Oettinger: Some of them!

Moorman: …who directly advise the president. They are not beholden to bureaucracy; they don't go through some processes. A lot of the intelligence capabilities that we marvel at today were brought you not by the bureaucracy in its wisdom, as it sort of bubbled up; instead, they came from this group of people who were up to speed on technology and knew what the needs were, and also had access to the president.

Oettinger: The members were Edwin H. Land, William O. Baker, and people like that.

Student: Zoe Baird?

Oettinger: There you're looking at the decline and fall.

Moorman: There are a certain number of political appointees in that process.

Oettinger: It was particularly bad in the Clinton administration. He just took folks to whom he had a debt and had to dump someplace, so he dumped them in the PFIAB.

Moorman: What this says is essentially to create a PFIAB for space. I don't know whether this will be done. One could argue that there is a significant overlap between the PFIAB and this, but this was basically a comment to mean that if you want to continue to have leadership, you need independent advice.

Oettinger: Could you stay a moment on the PFIAB, because I spent many years as a consultant to PFIAB, and it was in that interregnum when Carter killed it. My point is that it's very personality dependent. Did you go into greater depth and recommend any statutory bite to it, or did you leave this notion vague?

Moorman: There was no statutory bite, but I sure take your point about its being personality dependent: "personality dependent" meaning the president, and how much he wants this, and "personality dependent" on the leadership.

Remember, I mentioned that the Commission was critical of the interagency process, and believed it was fundamentally broken (**Figure 14**)? In the Clinton administration, it was by and large personality dependent; that is, the administrator of NASA, the deputy secretary of defense, and the secretary of commerce *might* be able to deal with some of these issues…if they got along. This says that you should have a standing interagency coordinating process for those issues that cut across the bureaucracy, and they're infinite: remote sensing, launch, export controls, and preparation for international fora. I could go on and on, but I'll just let you read that.

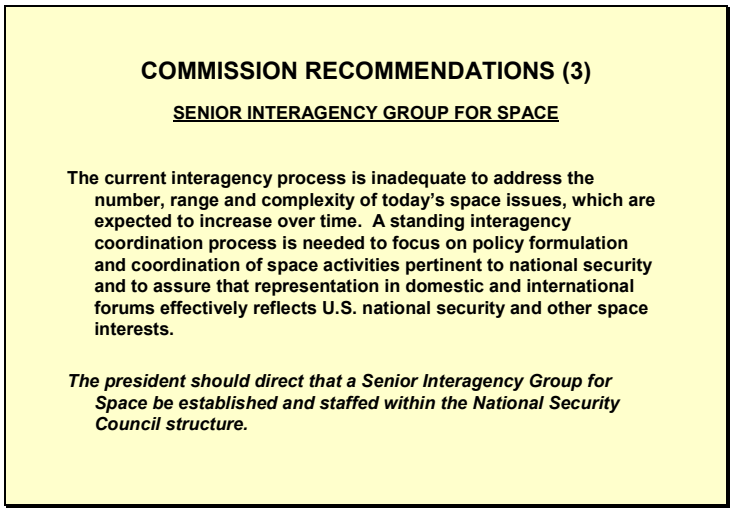

Figure 14

Oettinger: May I make a comment? "Standing interagency coordination process"? Every time I read "coordination" I can interpret it cynically as "obfuscation and general stasis," and therefore a standing coordination program would be one almost guaranteed to preclude any action. What's the thought behind this in terms of making this effective? I'm sorry; I keep asking questions in a way that sounds negative.

Moorman: I guess this is "still beating your wife?": "Why did you create this ineffective outfit that is standing and coordinating and does not have bite?" First of all, it begins with the premise that it will go under the NSC, and that in the NSC it will meet, and have agendas, and have the bite. Otherwise, you don't create it. It is created to fill a vacuum. Actually, we took a page out of the late 1970s: there was a senior interagency group structure in those days, as a matter of fact.

The interesting thing is that while all us retired guys were writing this thing, Condoleeza Rice came in and reduced the size of the NSC. We thought that the number of folks dealing with space on the NSC ought to be increased. It now has an Air Force O-6 [colonel] who deals with space issues. We thought it ought to have three or four. I don't know how that's going to come out.[6]

Oettinger: There's a pattern there, because the scuttlebutt I heard was that the PFIAB, for example, is going to be reduced to eight members, and maybe it reflects a notion that smaller numbers are more nimble and able to reach consensus and be effective. It would be interesting to see what actually results.

Moorman: The message for you in this was that the Commission believed there needs to be an interagency group in the White House to handle space. Remember, if you believe in the hypothetical Venn diagram I mentioned, the four space sectors are converging, which means you have many more seams and a lot more interaction. How do you work your way through? All those bureaucracies that are converging have differing viewpoints. How do you get a national approach to a lot of this stuff?

In my view—and please note that this is my personal belief, not the Commission's—there has been a series of things that have not been in the best interests of the United States. I won't go into great detail, but, as an example, our export control regime was tightened up substantially as a result of industry's dealing with the Chinese and their space program. Many thought that our contractors, by going over and helping them to launch communications satellites, compromised technology, so the executive and legislative branches engineered a very restrictive export control regime for licenses to do business. The upshot, depending on whom you believe, is that we lost either 10 percent or 40 percent of marketshare in communications satellites. This is important to our nation, because in the United States aerospace is second to agriculture in terms of the balance of payments or exports.

Here's the relationship between the SecDef [secretary of defense] and the DCI [director of central intelligence] (**Figure 15**). I think we discussed this issue already, and that you all know what to expect out of that.

One of the legitimate criticisms of this whole study could be, "Okay, all you space guys have focused and shone a bright light on here. Haven't you just created another stovepipe?" (You know what I mean by "stovepipe": an organizational structure that only thinks about space.) "Space exists within lots of different contexts. How are you going to deal with that?" This was one of the ways, that is, the creation of a new under secretary of defense for space (**Figure 16**), but this would bring space, intelligence, and information all together.

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[6]The Bush administration has created a policy coordinating committee for space under the NSC.

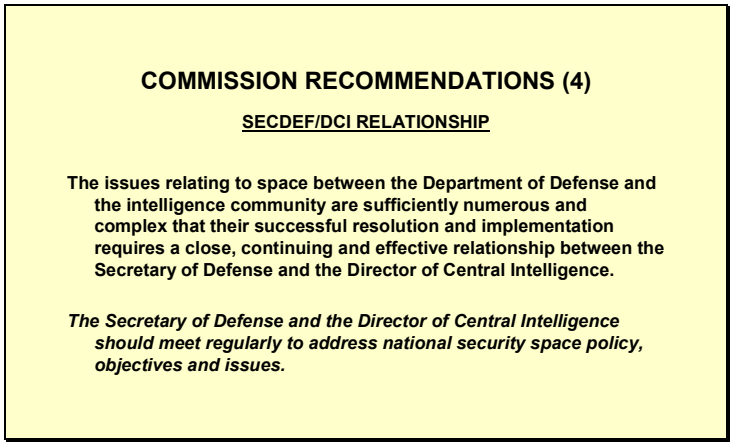

Figure 15

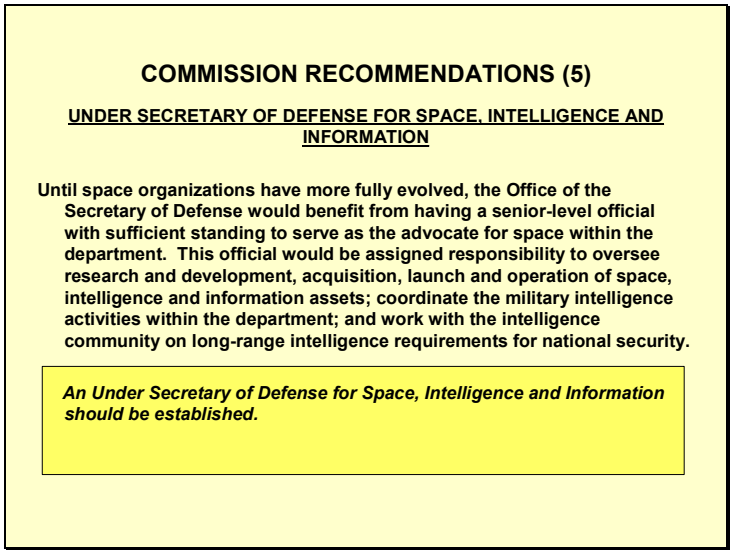

Figure 16

Oettinger: So this would be replacing the ASD C3I.

Moorman: Yes, it would be subsuming that office. I'm not sure this will take place, because it requires Congress to create another under secretary of defense position.

This next area may appear unusually detailed but I must remind you that the congressional tasking was very specific (**Figure 17**). Since its inception in 1985, CINCSPACE in Colorado Springs, one of nine unified commands, has always been headed by an Air Force aviator, and all the Air Force aviators except one came to the job with little space experience. What this recommendation says is, first, that the idea of only assigning Air Force guys is not right, and second, that it doesn't have to be an aviator. One of the reasons it was an aviator was because if you study the command chain involved, CINCSPACE is also the commander in chief of North American Aerospace Defense Command [NORAD], which is responsible for air sovereignty over the North American continent and warning of attack on the United States. The fact that part of

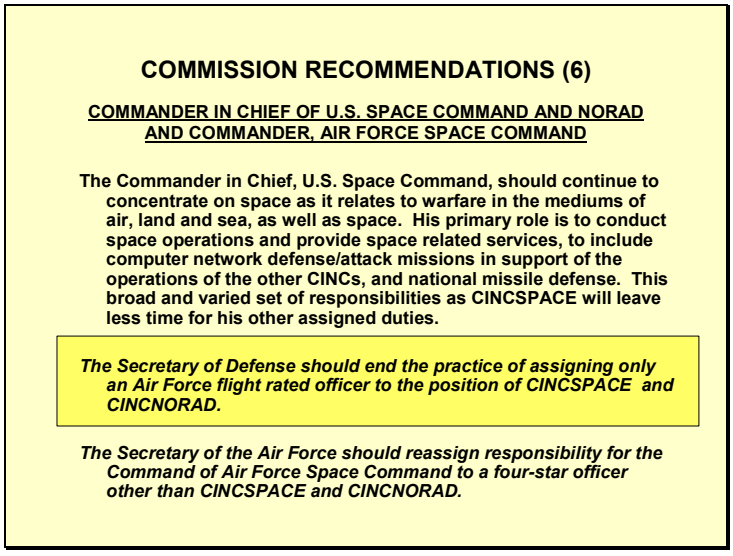

Figure 17

that responsibility requires fighter aircraft to go and surveil and intercept is one of the reasons that led to the rationale of "only an aviator."

I want to assure you that it has never been written in stone that CINCSPACE should only be an Air Force person. It turns out that, because of the allocation of commanders in chief, and I guess because the Air Force has the broadest experience, the Air Force has always gotten the job, but it has always been done on a "best athlete" basis. What I mean by that is that it is nominative: all the services have nominated over the years. I believe—again, my personal opinion—that it is likely that you will see an individual from another service as CINCSPACE.

This person has a third hat, which is as commander of U.S. Air Force Space Command, and we believed that is too much—that he has too many responsibilities. The thing those individuals spend the least time on is their major command within the Air Force, and that's why it's being pulled out as a separate four-star position. Remember, one of our taskings was to make recommendations on an organizational construct to develop "space warriors—a cadre of people." The current four-star position doesn't have the time to pay much attention to that cadre. I'm not finding fault; he's got a lot of things on his plate, and the most natural thing for him is to emphasize his joint jobs or his CINC jobs more than his Air Force job. We've had superb people out there, so it's not a comment on personalities; it's a comment on available time.

Oettinger: But the under secretary would also be assigned responsibility for information operations. Where would that go under your proposition?

Moorman: CINCSPACE has the responsibility for computer network defense and computer network attack. Under the Commission's findings, those responsibilities would remain there.

In terms of the sweep of history, this was perhaps the most significant thing we dealt with: the issue of a separate service (**Figure 18**).

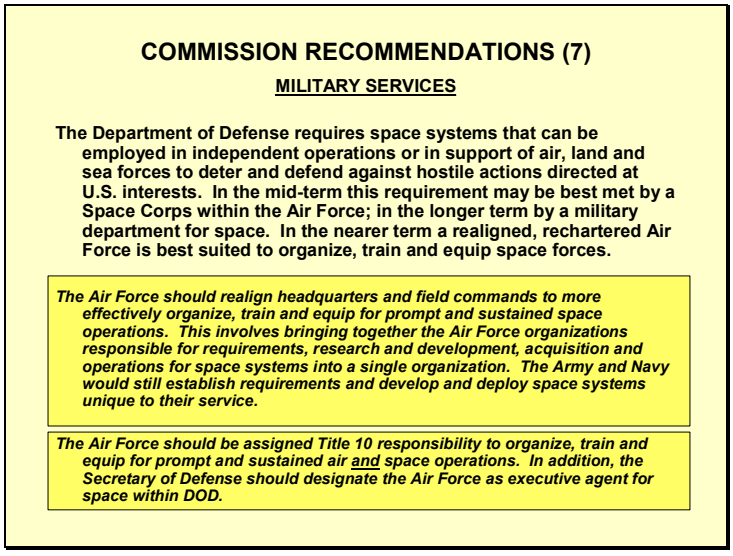

Figure 18

Oettinger: A quick gloss on the last item about Title 10 for those of you who are not familiar with it. Title 10 of the U.S. Code specifies that procurement, fielding, and training of forces are the responsibility of the individual services. The CINCs use those forces in military operations. That division of responsibilities runs very deep, not necessarily in the Constitution, but in statute. So far, every attempt to modify that has met with a lot of resistance, because there's a lot of boodle involved here and a lot of congressional, geographical stuff, because control over Title 10 means control over where the money gets spent by its contractors.

Moorman: Let me expand even more on the Title 10 issue. As Dr. Oettinger pointed out, Title 10 assigns authorities, in law, to the services, and those authorities center around the "organize, train, and equip." The language that deals with the U.S. Air Force says, "organize, train, and equip for prompt and sustained air operations." That's what it says today. This would propose to put space on a co-equal basis in Title 10: "Organize, train and equip for prompt and sustained air *and space* operations." Because it's in law, it requires the Congress to approve that. I don't know whether that will take place, but that was the intent: to raise the importance of space in the U.S. Air Force to the same level as air, in law.

Student: Were the Commission's recommendations presented as being unanimous from your group, or as a majority report, or if you had a consensus among a majority, did everyone agree to make it unanimous?

Moorman: I can talk to that, even on record. Early on, Mr. Rumsfeld said to us, "This will be a unanimous report." Let me tell you how that was achieved. Remember, I told you we met thirty-two times, often for twelve hours at a time, and remember that I thought Mr. Rumsfeld, through his intensive participation, had obtained the equivalent of a Ph.D. or certainly a master's-plus, in the space business? We debated every one of these points at great length and went over the final report line by line. The way consensus was achieved was that we just hammered out the wording and whatever. To answer your question, this was a unanimous, unfootnoted report. I can look you right in the eye and say that I don't know of any member who felt strongly about an issue who

said, “I got beaten down” or something like that. The more you discuss something from all sides, the more you come to what at least that group of people could get consensus on.

Student: I was just curious. I would think that would be very significant with regard to the weight you would expect the recommendations to carry.

Moorman: That’s a very good comment. You’re quite right. For the rest of you, let me put another flip on this. I have been on commissions where there were dissenting views. The dissenting views were captured in things called footnotes. The problem with footnotes, if you’re trying to get something done, is that those who don’t want to do something seize on the footnote, and that’s where the debate begins.

Oettinger: Before you go on, let me expand on the matter of footnotes, because if you want immediate decisiveness, you want to avoid footnotes. You want unanimity. In terms of what I’ve been hammering at you about balances shifting and so on, you may want a different approach, however. If you look at two traditions, one being the Jewish Talmud and the other the U.S. court system, you see that the record of the dissents plays an enormously important role. It simply reflects a different set of assumptions, in case the issues remain open, and the track record of the dissents is an important part of the process as a record of what may be there for reconsideration the next time around. In the judicial history of the United States, the dissents are often the most interesting parts of the record. They are signals for the next transformation of the law. There’s a balancing act there between short-term effectiveness and long-term strategic flexibility, which is an important element.

Moorman: The first boxed item on the slide [Fig. 18] is exceedingly important. Let’s take the Army as an example. Right now, the Army has an acquisition command that does research and development and acquisition of weapon systems, it has a test and evaluation unit, and then it has a series of operational commands that operate the equipment, but they’re organizationally separate. It’s the same in the Navy and the Air Force. Remember, we were after critical mass, so we have recommended—and I believe it will happen—that the research and development, acquisition, and operations activities, which are now separate, be combined under the commander of Air Force Space Command. You would now have all the space-qualified people in one group—a so-called womb-to-tomb or cradle-to-grave setup. That’s a very major change in mindset. It happens to be the way the NRO is organized today.

That’s what this says, but for all of you who come from other services, or are familiar with other services, the Commission was concerned about and bent over backward to recognize the equities of the other services. This is Air Force-centric, because in the space business 90 percent of the people and 88 percent of the budget are in the Air Force. That’s why it comes out the way it does. But what about the Army and the Navy? What the recommendation says is that in this regime the Army and the Navy will still state requirements for space systems. They will also develop applications or exploit space—how you use these systems—and buy terminals and things like that. This also says that if they have a space system that can be construed to be unique to their service, they can go ahead and develop it. Otherwise, the Air Force buys all the common user space systems for the Defense Department.

I’ll let you read this next chart (**Figure 19**), and then I’ll try to explain what it means. Remember critical mass and centralization? Remember the tasking that says it wants you to deal with the intelligence and nonintelligence space sectors? This recommendation deals with that

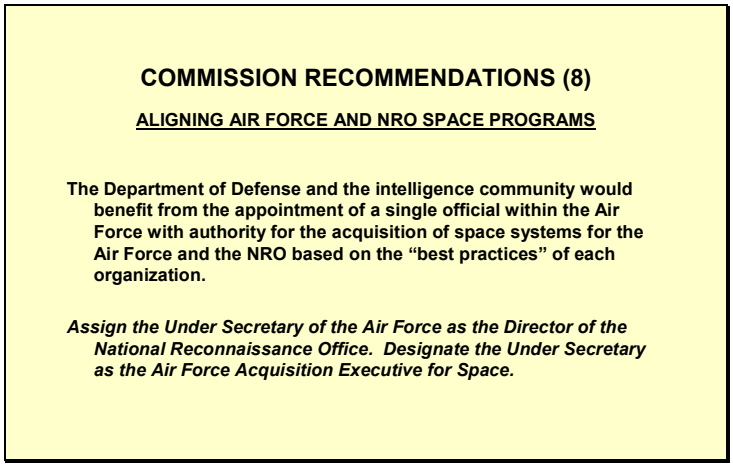

Figure 19

issue. This returns to life as it was for the first twenty-five to thirty years, when the under secretary of the Air Force and the director of the NRO were one and the same. That's basically what that says, and what you hope in making sure these organizations are joined at the hip is to come up with best practices. A lot of people would say that the NRO is more efficient than the Defense Department in building satellite systems.

This next slide deals with innovative research and development (**Figure 20**). It says the SecDef and the DCI should create a special office to deal with particularly difficult problems—an Office of Strategic Reconnaissance—and it says that competing offices to build systems is a good thing. It also recommends a role for the military service labs and the Defense Advanced Research Projects Agency.

Student: Where does the Office of Strategic Reconnaissance sit?

Moorman: Very good question. Under this proposal, it sits under the DCI. The reason I said it the way I said it is that a month and a half before the Space Commission reported out, something called the NRO Commission reported out, and they created a similar organization, but reporting to the director of the NRO.[7] Their title was "Office of Space Reconnaissance." The significance of this difference is that our recommendation might be responsible for all kinds of sensing systems and all kinds of platforms. That's about as far as I'll go on that one.

Student: Sir, we had Cheryl Roby from the ASD C3I office here a few weeks ago. She was talking about this and mentioned it might be under the SecDef, in the ASD C3I organization.[8] I guess there's a lot of tension here.

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[7]See *Report of the National Commission for the Review of the National Reconnaissance Office*, [On-line]. URL: http://www.fas.org/irp/nro/commission.htm

[8]See Cheryl Roby, "Challenges Facing the Defense Department in the Twenty-First Century," in *Seminar on Command, Control, Communications and Intelligence, Guest Presentations, Spring 2001* (Cambridge, Mass.: Harvard University Program on Information Resources Policy, I-01-3), forthcoming.

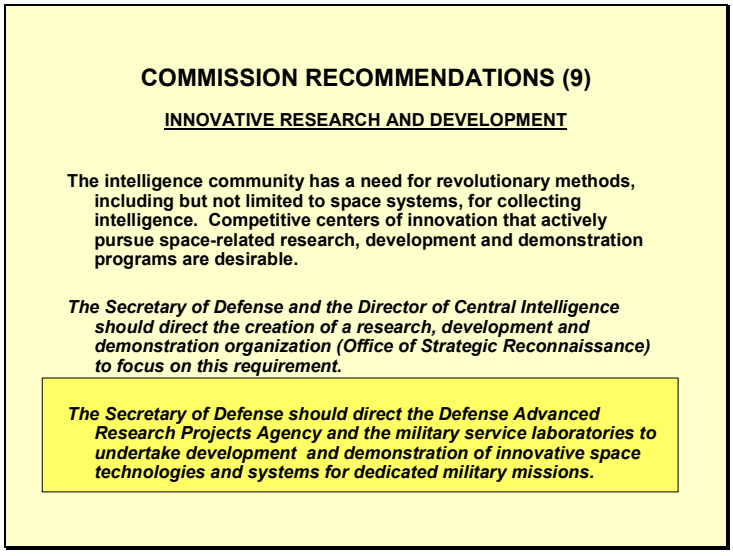

Figure 20

Moorman: Where you stand depends on where you sit, I guess. I will seek refuge in the old statement that I'm a planner and sit on commissions; I'm not an implementer. This is going to have to be decided between the DCI and the SecDef. Let's leave it at that, rather than carrying a brief for any particular position.

There is great angst about this recommendation in the Defense Department (**Figure 21**).The reason for angst is that if you're a service chief or someone responsible for a budget you hate fenced budgets. The reason you hate fenced budgets is that they take away your flexibility to move funds around. They asked us to look at this.

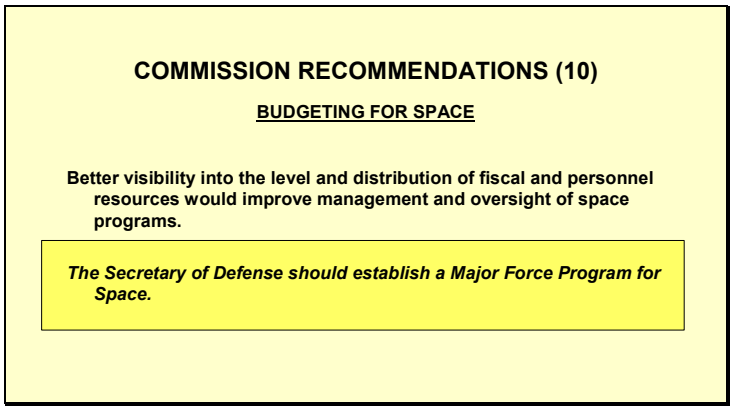

Figure 21

I'm sorry for the arcane language that is used in the Defense Department. Let me explain what a Major Force Program is. If you take the entire $290 billion (or whatever the defense budget is), it is divided into Major Force Programs 1 through 11. For example, Major Force Program 1 is strategic; Major Force Program 2 is general purpose forces; somewhere in there you have communications, intelligence, et cetera. The last Major Force Program we created was

numbered 11, and what created that was similar to the kind of tasking here. Major Force Program 11 dealt with all the resources related to the special operations mission. Let me take you back to when we did that about fifteen to twenty years ago. No one was paying attention to special operations. You remember Desert One, when we sent helicopters over to rescue the hostages in Iran [1979]. It was a great failure. All of a sudden, we started getting interested in our special operations capability. Part of getting interested was defense budgeting so we would buy the things that special operations forces need.[9] That now is controlled by an assistant secretary of defense and the CINC for special operations.

This is a little different. It is not controlled by the CINCSPACE. It is not a fenced budget. It is an administrative device, like Major Force Programs 1 through 10: that is, a grouping of how much you spend on space in the defense budget. You might ask yourself, "Why would you do that? Doesn't that sound like a fenced budget?" It isn't, because you can pull money out of it to fund other kinds of things.

The reasons we did it were to get a handle on how much the country spends on national security space and to ensure synchronization. What I mean by that is that the space business is so interrelated that if you're not synchronizing and you're not examining linkages carefully, you may be making very bad decisions. For example, in defining a space system there are launch systems, command and control systems to control satellites, space systems, and terminals to receive the data. If you get any one of those out of phase, you're in trouble. For example, I build and launch a satellite, it goes up, and I say, "Whoops! I didn't fund the terminals! I just spent several hundred million dollars for this satellite, and I can't receive the data from it." You might say, "That wouldn't happen." Oh, yes, it does! Individual services are making decisions all the time, and they may want to take terminal money and fund a tank, a destroyer, or an airplane. This recommendation to create a device to collect the budget data on all space systems would make it harder to do. It's not fenced, but decisionmakers could see the process a lot better.

A very interesting phenomenon: after we reported out on January 11, the true dollars we're spending for space turned out to be a lot higher than what was in the documents. This really shouldn't surprise you, because they started aggregating all the relevant programs.

Student: How widespread were mistakes like that?

Moorman: I don't know how I can answer that. It happens because of the imperatives and tyrannies of budget cuts. Remember, the defense budget has come down 38 to 40 percent since 1985. In responding to that, you often make some capricious cuts.

Oettinger: Another factor is short-term memories. Program managers, especially when they're military, get rotated out every two or three years, or whatever it is, and after a while the civilian folks are doing the jobs routinely and don't remember why they work.

Student: Every year, when they're doing the final processing in the services, probably 65 to 70 percent of the people involved in the decisionmaking are doing it for the first time. That's another

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[9]For a discussion of the beginnings of Special Operations Command, see Earl F. Lockwood, "The Evolution of Special Operations Forces," and Robert C. Kingston, "The Special Operations Command: Structure and Responsibilities," in *Seminar on Command, Control, Communications and Intelligence, Guest Presentations, Spring 1988* (Cambridge, Mass.: Harvard University Program on Information Resources Policy, I-89-1, March 1989), 107–124 and 125–140, respectively, [On-line]. URL: http://www.pirp.harvard.edu/pubs.html

phenomenon. They have larger jobs, and, in fact (personal opinion again), it's amazing that the outcomes are as good as they seem to be in spite of this.

Moorman: I agree.

Oettinger: I was in a meeting yesterday where somebody was giving the example of the artillery where there was a guy who just stood behind the gun platform every time before the order to fire was given, and the question was, "What was this guy doing?" A little investigation revealed that he was the guy who held the horses to keep them from shying when the guns went off, and folks had forgotten to abrogate the position when they no longer used horses.

Student: We just read Snook's book about the "Friendly Fire" incident.[10] In an era where other CINCs can't get adequate spare parts, and their operations tempo is extremely high, it seems to me that if I were CINC Whatever I would be very opposed to spending heavily on what you're describing here. If I'm the commandant of the Marine Corps, I want Nomex [heat and flame resistant] gear for my Marines; I don't need any fancy space programs right now. Is that tension going on between the other CINCs?

Moorman: It isn't quite that dramatic. Actually the U.S. Navy is the greatest beneficiary of space when you really think abut it. Why is that? Because they're in the middle of the ocean. They need it most.

Student: They don't know how to navigate any more! It's all electronic.

Moorman: So you'd be surprised. The requirements against space are vast. You've chosen an interesting example. Of the four services, the least interested might be the Marine Corps, but I am not even sure of that. By contrast, look at the digitized Army, and then see how much of that is going to be dependent on space systems.

Oettinger: That tank can't drive any place without GPS.

Student: They were doing an exercise at Fort Benning, because I'm writing my paper on this—where they went into combat with four computers out of fifteen in a battalion of tanks working, and they were getting communications like, "My computer is down. I can't find my way; somebody tell me where I am." That's what we were talking about with the digital Pearl Harbor. You might as well write off the force. If they don't know where they are, they can't fight."

Moorman: What is interesting is that if we would have recommended, rather than an Air Force executive agency for space, that we charge the other services for the information they receive (a bit-stream charge), you'd have had insurrection beyond belief, because space is now a free good, as long as space doesn't get out of hand. If you believe that ultimately you may get weapons up there in space, you may see a major shift in the budget, but today I see significant support for the current level of space funding. Nobody has enough, and the reason is bandwidth.

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[10]Scott A. Snook, *Friendly Fire: The Shootdown of U.S. Black Hawks over Northern Iraq* (Princeton, N.J.: Princeton University Press, 2000). Also see Scott A. Snook, "Leading Complex Organizations: Lessons from a Tragic Organizational Failure," in *Seminar on Command, Control, Communications and Intelligence, Guest Presentations, Spring 2000* (Cambridge, Mass.: Harvard University Program on Information Resources Policy, I-01-1, July 2001), [On-line]. URL: http://www.pirp.harvard.edu/pubs.html

Your point is well taken. The Marine Corps probably looks most askance at these recommendations, or worries the most, but everybody wants better space capability. Nobody has enough, and the reason is bandwidth. Everything we do now is enabled by space systems, and let me give you an example. The organization crying most loudly for space-based radar, which we don't have today, is the U.S. Army. I'm talking about a ground MTI—a ground moving target indicator from space.

Student: Usually, in peacetime you need a Pearl Harbor for these changes to take place. It is such a big change that I personally can't see it happening before you have at least a blip that a Pearl Harbor might happen. Obviously, the Commission is recommending the correct things, but will the political pressures leave that?

Moorman: If you'll permit me, that sounds too black and white. I agree with what you're saying with regard to a huge spike in funding and even a separate service (and, remember, I said I personally didn't think a space service would happen unless we had an external event; you can call it a Pearl Harbor; you can call it someone else doing something dramatic to affect our space systems). On the other hand, being prepared is essential. The longest lead time may be to develop the people—the force able to operate in that environment. This is setting the stage and the switches so that you can evolve for that if you have to. I don't disagree with you at all: the major spike—going to weapons in space, or going to a space service, probably will be created by an external event.

Oettinger: This is not unprecedented. Go back to your reading in Greg Rattray's book about strategic information warfare and his chapter on the history of U.S. airpower between World War I and World War II.[11] The gradual development of ideas, doctrine, training, et cetera, took a very similar path. Rattray says that commission after commission met, but in World II, that's where the leaders and the ideas came from—from those exercises.

Moorman: Let me take his parallel. It's an excellent question, and an excellent line of thought. I'm fourth-generation military, and military history is my avocation. As Dr. Oettinger said, we didn't get a separate air force, for example, because of commissions or spokespersons like me in the 1920s. I maintain we got it by a gradual development of appreciation for airpower in World War II, and then—this is the "event"—the introduction of the nuclear weapon, and the Russians having it, combined with the delivery system, which was the B-29/B-50. The Air Force was created partly to ensure we kept that capability, which was so key to our security as a nation, under a service that was air oriented rather than terrestrially oriented.

Now, let's fast forward. Suppose we go to weapons in space, or someone threatens us. If the U.S. Air Force continues with just an air orientation, like our Army colleagues of the 1920s and 1930s, then you may very well go to a separate service, because your security necessitates that you have a force dedicated to the space medium.

This is our conclusion (**Figure 22**). What we're talking about are steps along a journey. By the way, this Commission report is not going to make a big impact on the budget. This isn't a big

[11]Gregory J. Rattray, "Development of U.S. Strategic Airpower, 1919–1945: Challenges, Execution, and Lessons," in *Strategic Warfare in Cyberspace* (Cambridge, Mass.: The MIT Press, 2001), 235–308.

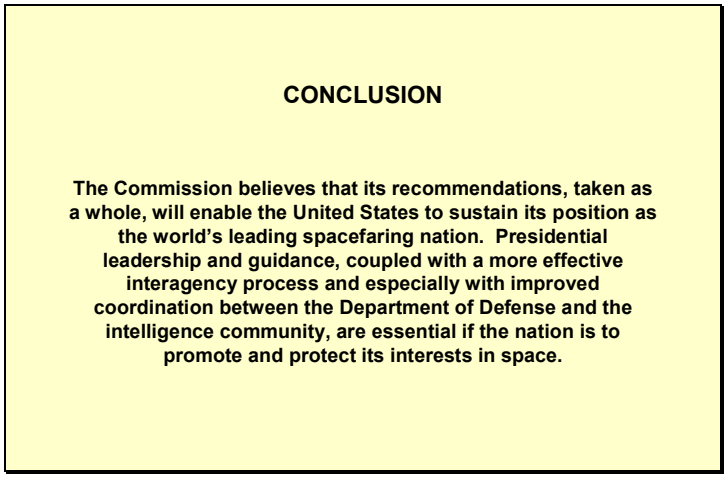

Figure 22

push for more funding. If some of our recommendations are implemented, the biggest plus-up will be in the science and technology area, not in space systems.

Oettinger: I hate to break into this, but we promised to free you at 3:30, and I want to be true to our promise. But I'd like to thank you very much with a small token of our large appreciation.

Moorman: Thank you very much.

Acronyms

ASD C3I	assistant secretary of defense for command, control, communications and computers
CINC	commander in chief
CINCNORAD	commander in chief, North American Aerospace Defense Command
CINCSPACE	commander in chief, U.S. Space Command
DCI	director of central intelligence
GPS	Global Positioning System
NASA	National Aeronautics and Space Administration
NCA	National Command Authorities
NORAD	North American Aerospace Defense Command
NRO	National Reconnaissance Office
NSC	National Security Council
PFIAB	President's Foreign Intelligence Advisory Board
SecDef	secretary of defense
SPACECOM	U.S. Space Command
USA	U.S. Army
USAF	U.S. Air Force
USN	U.S. Navy
WRC	World Radio Conference


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