S. HRG. 107–227

# REPORT OF THE NATIONAL COMMISSION FOR THE REVIEW OF THE NATIONAL RECONNAISSANCE OFFICE AND THE REPORT OF THE INDEPENDENT COMMISSION ON THE NATIONAL IMAGERY AND MAPPING AGENCY

## HEARING

BEFORE THE

SUBCOMMITTEE ON STRATEGIC

OF THE

## COMMITTEE ON ARMED SERVICES
## UNITED STATES SENATE

ONE HUNDRED SEVENTH CONGRESS

FIRST SESSION

APRIL 3, 2001

Printed for the use of the Committee on Armed Services

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APRIL 3, 2001

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**TUESDAY, APRIL 3, 2001**

U.S. SENATE,
SUBCOMMITTEE ON STRATEGIC,
COMMITTEE ON ARMED SERVICES,
*Washington, DC.*

The committee met, pursuant to notice, at 2:30 p.m., in room SR–232A, Russell Senate Office Building, Senator Wayne Allard (chairman of the subcommittee) presiding.

Committee members present: Senators Smith, Allard, Reed, and Nelson of Florida.

Committee staff member present: L. David Cherington, counsel.

Professional staff members present: William C. Greenwalt, Thomas L. MacKenzie, and Eric H. Thoemmes.

Minority staff member present: Creighton Greene, professional staff member.

Staff assistants present: Beth Ann Barozie and Thomas C. Moore.

Committee members' assistants present: Douglas Flanders, assistant to Senator Allard; Menda S. Fife, assistant to Senator Kennedy; Christina Evans and Terrence E. Sauvain, assistants to Senator Byrd; Elizabeth King, assistant to Senator Reed; Peter A. Contostavlos, assistant to Senator Bill Nelson.

## OPENING STATEMENT OF SENATOR WAYNE ALLARD, CHAIRMAN

Senator ALLARD. I call the Strategic Subcommittee to order. We like to have a reputation of starting on time.

I know that we do not have all of our witnesses here, and Congressman Goss is going ahead, but at least I think we want to start with opening statements, and then if Congressman Goss does not mind, then we will go ahead and proceed with those of you who are here.

The Strategic Subcommittee meets today to receive testimony from the National Commission for the Review of the National Reconnaissance Office (NRO) and from the Independent Commission on the National Imagery and Mapping Agency (NIMA).

These two commissions, which were established pursuant to congressional direction, have performed a critical service, as we seek to revitalize United States space and intelligence organizations and operations. I believe that it is appropriate that we hear from both the NRO and the NIMA Commissions in a single hearing, given the close and synergistic nature of these two organizations.

This hearing also complements the testimony that the subcommittee received last week from the Commission to Assess United States National Security Space Management and Organization, which was chaired by now Secretary of Defense, Donald Rumsfeld. All three of these commissions have made important recommendations that this subcommittee will carefully evaluate as the new administration charts its path regarding space and intelligence.

On our first panel, we will receive a presentation from the NRO Commission. When we have the co-chairmen here, I will want to give them an opportunity—that is Congressman Porter Goss, he is the co-chairman with his fellow commissioners, Larry D. Cox, Martin C. Faga, and Bill Schneider, Jr., of the NRO and NIMA Commissions, to make a few remarks.

I would like to point out that it was my privilege and great pleasure to serve on the NRO Commission with these distinguished gentlemen. I understand that later on Congressman Goss will be making an opening statement.

On panel two, we will hear from the chairmen of the NIMA Commission, Peter Marino and Kevin O'Connell, and then the Commission's executive secretary. We are looking forward to that presentation as well.

Now, before I turn it over to Representative Goss for his opening statement, I will recognize my ranking member, Senator Reed, for any opening statement he would like to make.

**STATEMENT OF SENATOR JACK REED**

Senator REED. Thank you very much, Mr. Chairman, and thank you for calling this very important hearing. I want to join you in welcoming our witnesses this afternoon.

It is good to see Congressman Goss, who is a colleague from the House, and also Mr. Cox, who is a colleague from the House Intelligence Committee, and Mr. Faga, welcome.

I think that we would all agree, in peacetime or in any future conflict, we are relying much more heavily on our ability to provide useful, timely information to our decision makers, be they in the military or elsewhere in the government. Certainly, superior knowledge or information superiority is central to executing Joint Vision 2020, or any other reasonable national military strategy that may emerge from the ongoing defense review.

The NRO and the NIMA have been playing and will continue to play a critical role in supporting these national priorities. How we manage and modernize these two vital organizations and their activities deserve the attention of this subcommittee and Congress. We need to make sure that we are marching on the right path.

These two Commission reports, which have broad implications for the NRO and NIMA for the future, will be most helpful as we conduct our oversight responsibilities. I look forward to hearing

from the Commission representatives today, and again, thank you, Mr. Chairman, for holding this hearing, and for your service on the Commission.

Senator ALLARD. Thank you very much, Senator Reed. It is good to hear from you.

We will proceed with our testimony. Just to give the panel and the members of the subcommittee an idea of what our schedule may look like this afternoon, I have been told that we can expect to vote around 3:15, or so. Now, that may be delayed, but right now, until we find out the schedule, we are assuming that that will happen, and as soon as that vote comes up, my idea is that we will go vote right away, and come back and finish the subcommittee's business.

So let me go ahead and recognize Congressman Goss, who I served with in the House, an expert on intelligence matters. It is good to have you here before the Senate subcommittee, Mr. Congressman.

**STATEMENT OF PORTER J. GOSS, CO-CHAIRMAN, NATIONAL COMMISSION FOR THE REVIEW OF THE NATIONAL RECONNAISSANCE OFFICE**

Congressman GOSS. Thank you very much, Mr. Chairman. I am pleased to look up and see two former colleagues, and wonder what happened to me, where I went wrong.

Senator ALLARD. We know the feeling, Porter. [Laughter.]

Congressman GOSS. I am pleased to be able to address the subcommittee this afternoon, Mr. Chairman and Mr. Reed. I think that the work that we did on the Commission is very useful. I do not think it is definitive, in the sense that it is a final recommendation, but I think that it is a series of conclusions at a time of evolution in our intelligence capabilities, at a time, equally, when we are reviewing new types of threats to our national security, and, in fact, perhaps even a new definition to our national security.

I am fortunate today to be accompanied by several commissioners, at least two, I see so far. I do not know how many others are coming. Of course, Senator Allard, who served on the Commission. I think we have provided to the subcommittee the materials from the Commission, and any comments from Senator Kerry, who was Co-Chairman, I am sure are available, and if not, can be made available.

I plan to make a brief opening statement, if that is all right, Mr. Chairman, for the record. Considering the time constraints, it will be brief, a couple of minutes. If you want me to forego it, I will submit it for the record. I would prefer to make the statement, because it synthesizes what I think we did.

Senator ALLARD. You may proceed here, Congressman. That will be fine.

Congressman GOSS. Thank you.

The Commission was formed pursuant to the Intelligence Authorization Act of Fiscal Year 2000. The legislative mandate for the Commission was driven by recognition of the changing threat environment and the growing concern about NRO's ability to provide innovative space-based capabilities that are so vital to maintaining our national security, and, indeed, are unique.

The Commission held numerous meetings, as you will recall. We received testimony from literally dozens of witnesses, from March to November 2000, across a scope of interests. The complete list of interviews and witnesses is included in the final report, again, which I understand you have.

The Commission found that the NRO reconnaissance satellites have had a crucially important role during the past four decades in providing American presidents a decisive advantage in preserving the national security interests of the United States, and having just come from the celebration of the fortieth anniversary of the NRO, I cannot emphasize how strongly what a proud record that has been.

In many ways, the risks to the United States from the potentially catastrophic acts of terrorism and weapons of mass destruction and mass disruption are more complex today than those the United States confronted during the Cold War.

In addition, the number of extended U.S. military commitments and other U.S. interests around the globe that require continuing support is stressing the capacity of NRO reconnaissance systems and the intelligence community to detect critical indications and warnings of potentially threatening events, and I can say that as we sit here today, we are, indeed, testing our asset capability very strongly with events that have come upon us over the weekend. Together, these and other evolving conditions place an enormous premium on maintaining a strong space reconnaissance capability.

NRO capabilities have been available in the past, because President Dwight Eisenhower and his successors clearly understood the significance of space reconnaissance to our national security. They had the tenacity and determination to endure the many risks and failures inherent in space technology, and they personally directed and sustained the investment needed for its development.

Those are critical points, lots of risk and lots of very high-level commitment to the project. However, the clarity, and mission, and the sense of urgency that led our past presidents and congresses to invest in the future of space reconnaissance has dissipated since the end of the Cold War, since the wall has come down. The disappearance of the Soviet threat has provided a false sense of security, and has resulted in under investment in the NRO and other intelligence systems. It is not just the NRO.

This comes at a time when the array of threats facing the United States has never been more complex, and the demands on the NRO and our other capabilities from new customers have never been more intense. The advances in military technology have led military customers to develop a voracious appetite for NRO data. At the same time, non-military customers increasingly demand more information from the NRO regarding a broad array of intelligence targets.

Also, dynamic changes in information technology are significantly affecting the NRO. In the absence of additional resources, the NRO is being stretched thin, trying to meet all its customers' needs, and I have not even begun to talk about denial and deception, and what other people are doing to frustrate some of the capabilities we seek to get through the NRO.

We believe the American people may assume that space-based intelligence collection matters less today than it did during the Cold War at a time when paradoxically the demand for the NRO's data has never been greater than it is now. The Commission's final report stresses the need for decisive leadership at the highest levels of government in developing and executing a comprehensive and overarching national strategy that sets the directions and priorities for the NRO.

Without that commitment from the top level, we do not think it will happen. This is risk heavy, commitment heavy, and attention heavy, and perhaps this subcommittee's efforts will help us get those ingredients.

Ensuring that the United States does not lose its technological eyes and ears will require the personal attention of the President, the Secretary of Defense, and the Director of Central Intelligence, along with diligent oversight by Congress, and I will add, working together.

There has been and will continue to be, understandably, heavy pressure to maintain current aging capabilities rather than to bear the expense of riskier modernization and development of advanced technologies. Some of us have seen this manifested in different ways.

The fact of the matter is, we have to deal with today, but we have to get ready for tomorrow. Without bold and sustained leadership, and the necessary resources, the United States could find itself deaf and blind, and increasingly vulnerable to any of the potentially devastating threats it may face in the next 10 to 20 years, some of which I cannot even imagine yet.

Failure to understand and support the indispensable nature of the NRO as the source of innovative, new space-based intelligence collection systems will result in significant intelligence failure.

These failures will have direct influence on strategic choices facing the nation, and will strongly affect the ability of U.S. military commanders to win decisively on the battlefield, and we have just come from a wonderful battlefield success in the Gulf, where we understand the value of getting it right, what that does in terms of risk potential for our troops in harm's way. Consequently, I think that we have found success, we have to continue to find success, and I believe the NRO is very much a part of that formula.

At this time, Mr. Chairman, I would, with your permission, offer the other commissioners the opportunity to make comments, and I would be pleased to answer any questions you have on any of the particulars.

Senator ALLARD. Thank you, Congressman.

Mr. Cox.

**STATEMENT OF LARRY D. COX, MEMBER, NATIONAL COMMISSION FOR THE REVIEW OF THE NATIONAL RECONNAISSANCE OFFICE**

Mr. COX. I do not have any prepared statement made, but I want to make a couple of points. Some of these will reinforce what Congressman Goss just said.

There has been a decrease, I believe, in the budget flexibility available to the NRO. In time past, you may remember when the

technological needs, and, therefore, the cost of financing R&D were something the NRO did intuitively, and it had sufficient, some would argue over-sufficient, budget to actually execute that and do that.

There has been some reduction in the flexibility to execute budget against both programs operational and R&D for the future. Something that I think is a major concern is the use of the power of the Director of Central Intelligence (DCI) for streamlined acquisition.

The DCI has been given the power to do a class of streamlined acquisition that can allow rapid procurement of capability to support the intelligence community, and the willingness or the interest in DCI has declined in exercising some of that streamlined acquisition authority, I would say.

There is a continuing need to balance the intelligence requirements of the national decision maker with military support requirements. Some of the responsibility for adjudicating the split between those classes of requirements has fallen to the builders of systems. If you think of the NRO as an acquisition agency, an agency that designs, develops, procures, operates, and derives data from classified systems, then you understand that it is an engineering organization, most effectively.

It takes requirements from intelligence agencies and turns them into intelligence technical capability. So a NIMA, for example, would present a set of imagery requirements to an NRO, and NRO would design, develop, and build the capability to support those requirements. Similarly, an NSA would offer its intelligence requirements, the NRO would respond with technical capability, and the CIA, and so on.

Well, the decision about what is space, and what is air, and what is human, I do not think should fall to an agency responsible for building the capability against those things, but what has happened is, I think a lot of the responsibility for maintaining the balance between requirements has either fallen to the NRO as a developer, or it has found itself in the position of having to defend its decisions about how to balance intelligence requirements in its design and development of systems.

The tasking, processing, exploitation, and dissemination (TPED) issue is a pretty good example of that. Arguably, the tasking, processing, exploitation, and dissemination of intelligence data, imagery, for example, should lie with an imagery agency, NIMA; yet, the TPED issue has fallen squarely on the shoulders of the NRO as the builder of capability. So the point of this is that I think intelligence agencies should get heavily back in the requirements business, and the acquisition agencies should get heavily back into the leading edge technological acquisition business. So that would define more clearly a role for the NRO as a technological agency, and probably less so as an intelligence agency. Thank you.

Senator ALLARD. Mr. Faga.

**STATEMENT OF HON. MARTIN C. FAGA, MEMBER, NATIONAL COMMISSION FOR THE REVIEW OF THE NATIONAL RECONNAISSANCE OFFICE**

Mr. FAGA. Thank you, Mr. Chairman.

I would like to offer some comments on a specific matter that I know is of interest to the subcommittee, and that is the matter of the advisability of moving the NRO operations to the Air Force, which has been a subject of interest for many years, and I offer this view as a member of the Commission, and also as a former director of the NRO.

First, I strongly support further integration of Air Force and NRO activities. I think that is absolutely essential and also inevitable. The subject of transferring operations is one that I think is confused. There is an important variation in language used here. In the sense in which a military officer usually uses the word "operate," the NRO does not operate satellites at all.

At its ground stations, the NRO uses a largely contractor workforce to provide for the health and maintenance of satellites, collect data to pass to others for analysis, and most importantly, to send commands to the satellites on what they should do, but these decisions on what those instructions will be, that is, to operate the satellites, are decisions made outside the NRO by organizations within NIMA and within NSA.

During the Persian Gulf, I was frequently called by officers at Central Command who would ask me to arrange a specific collection by the NRO, and I would explain that I did not have the power to do it. They were amazed. I also explained that the officer who did have the power was a CENTCOM officer who was located in the same building that they were in. They were further amazed.

So in my view, the NRO could receive tasking instructions from the U.S. Space Command or the JCS for certain collection activities, if that should be a decision of the DCI and the Secretary of Defense. However, I see such a decision as separate from the matter of who should be the people at ground stations providing the technical functions that need to be performed there.

Since no operational decisions are made by the NRO or its contractor personnel, this is not the place to decide what the increased role of the Air Force or other military entity ought to be. The ground station function is simply part of the NRO's successful cradle-to-grave philosophy.

Mr. Chairman, I would be happy to discuss this and other points, and your questions.

Senator ALLARD. Thank you.

Mr. Schneider.

**STATEMENT OF HON. WILLIAM SCHNEIDER, JR., MEMBER, NATIONAL COMMISSION FOR THE REVIEW OF THE NATIONAL RECONNAISSANCE OFFICE**

Mr. SCHNEIDER. Thank you, Mr. Chairman.

I would just make a few additional points. The NRO Commission study happened to occur more or less simultaneously with two other important aspects of the Intelligence Community, including the Committee on the National Imagery and Mapping Agency, and Secretary of Defense Rumsfeld served as a the Chairman of the Space Commission.

These Commissions have highlighted the importance of a modern and highly effective intelligence system, which Secretary Rumsfeld is now working energetically to implement. Intelligence and the

transformation of our intelligence capabilities to meet the challenges of the 21st century threats are a special-interest item to the Secretary, and he has taken very seriously one of the recommendations made by the NRO Commission, and I think affirmed by the others as well, which is to increase the intensity of collaboration with the DCI, as the NRO billet is ultimately filled with the NRO as well.

So I think one of the central elements of having a high order of cooperation between the Secretary of Defense and the Intelligence Community will be implemented.

Further, the needs of the Department of Defense for not merely better intelligence, but perhaps one might say exquisite intelligence to support its operations in the kind of threat environment we are likely to encounter in the first quarter of this century makes the implementation of many of the NRO Commission recommendations important, and I know the Secretary will be following these energetically, and I am very pleased, as a member of the Commission, to note how seriously the Commission's work has been taken, and the appreciation for Congress in raising the visibility of this issue, so that it could be engaged and implemented by the new administration.

Thank you, Mr. Chairman.

Senator ALLARD. I want to thank the panel for their testimony, and I want to let the panel know that I consider it an honor and certainly very much a learning experience to be able to serve with you on the NRO Commission and its discussions that we have had.

One of the things that I wanted to get on the record is that during a lot of the debate we were talking about the leading edge technology that actually got the NRO started, but then as we moved forward, we got more into the maintenance and sustaining systems that were already put in place. The question was coming up, can we continue to push the leading-edge aspect and also be involved with maintenance and continuation with the systems that are there.

I guess from a policy standpoint on this end, if we may have limited funds, I think all of us were talking about the fact that we wanted to see that cutting edge maintained, as far as the NRO, but that may mean that you have to give up some of the maintenance systems.

Is there any thought as to where those systems may be transferred once you get into a posture where you are doing maintenance and incremental upgrades on what you have? Does anybody want to respond to that? For example, is the Air Force the proper place to transfer that, if we do that?

Mr. COX. I would say there is a very important thing to understand about the NRO systems. They are very long-lived, they tend to be more complex operationally than the typically, say, communications satellite, or other things that are the mainstay of the Department of Defense space systems.

I come from a narrower background, from the ground, up. I have worked consoles, I have sat in field stations, I have worked overseas on systems, hands-on, and then have been involved in the design, manufacture, building, and so on, so there is something different about them in this way. Operating them hands-on, directly,

lets you understand that this machine is more complex than a typical spacecraft machine.

It is very useful to have factory support when you run into problems with devices that last as long as these do on orbit. They last much longer than the typical spacecraft, not always by design, but by the way they are used and the way they are supported over their lifetimes by the heavy involvement of the contractor community typically that built the spacecraft itself.

That is unique, I think, in our U.S. space systems, and I would be disappointed if that were lost in a different kind of managerial kind of construct. There is an intimacy there built up through the design and operational process that is very important to maintaining these long-lived, expensive systems, and there are good procedures in place to make sure that it happens that way.

So that is a difficult thing. I think it is appropriate to separate operations from advanced R&D, no question about it. Whether it should go into another agency's hands for operation I think is subject to considerable debate.

Senator ALLARD. Yes? Mr. Faga.

Mr. FAGA. I would agree with that. I served on the Jeremiah Panel as well as the NRO Commission, and what we found most striking there was having reconnaissance programs in an agency that was under the joint direction of the Secretary of Defense and the DCI was very important.

Having worked in satellite reconnaissance from the design level, up to the director of NRO level, it is very important for all of the people involved to have a real sense of the mission. That is why the tie to the DCI is so important. He is, at least under our current system, also providing for the funding, so it is vital for the director of the NRO to be able to sit essentially at his table, fighting for those resources, as others fight to meet their needs.

I think that the idea we put forth in the Commission report of a separate office under the director of the NRO to try to deal with emerging new ideas is a way to separate new concepts from the demands of everyday life in a program office, and the mandate that today's satellites have to work today as something that we experiment with for the future, can afford to fail, something that has to fly and operate today must operate today, and program offices respond to that accordingly.

Senator ALLARD. Mr. Schneider.

Mr. SCHNEIDER. One dimension of that, Mr. Chairman, that is an important recommendation of the Commission, is to look at opportunities to transition some of the NRO's collection activities to the commercial sector. The technology that now exists in the commercial sector and the fact that it is now public policy to allow the commercial sector to operate imaging satellites with a resolution of half a meter provides an occasion where many of the commodity imagery requirements of the NRO can be met through the commercial sector, allowing the NRO to focus its special expertise on the tough military and diplomatic and security problems that require much higher levels of capability.

I think it is an illustration of the fact that the NRO needs to focus on the things that it can do best, both now and historically, and wherever possible, to have others who can deal with other

parts of its mission, and can do so efficiently, to be allowed to do so.

Senator ALLARD. I am going to give the ranking member time for some questions.

Senator REED. Thank you, Mr. Chairman.

Congressman Goss, you indicated that there is a need for enhancement of technology, and Mr. Cox, you indicated that there is a need for budget flexibility, which I presume includes increased budgets.

I wonder in the deliberations of the Commission, do you have a ballpark figure about how much recapitalization that we are going to have to do in the next, say, 5 years?

Congressman GOSS. The answer is, yes, I have a ball park figure. I have lots of ball park figures, and I am not being facetious at all.

Senator REED. No, I understand.

Congressman GOSS. It really depends on what you want to do. I am more interested in outcome than I am in shape or in turf of this.

Let me back up for a second. I think that my three colleagues on the Commission, who answered the Chairman's last question, basically discovered most of the parameters we talked about in terms of how do you deal with the fact that we are eating up a lot of the NRO time doing projects that maybe somebody else could do, should there be a transfer, is the TPED thing right, all of that we went into.

My conclusion was that it was not a zero-sum game. So if you are looking at the question within the box of just, we only have so many dollars, if you are going to transfer something out, then you have to do certain things.

Are the customers going to be happy if you do a transfer, are you going to get a makeup back inside the box, so you can go ahead and invest the savings on new R&D? Are you going to make sure that whoever is inside the box running the program is as competent? Some of these things, I think, as Larry Cox has said, are very complicated to deal with. It is not just a program where you switch somebody out of a seat and somebody else takes a seat.

So the answer to your question is, I think that the process should be driven by the policy needs of this country to protect the national security of the country, with the capabilities we need to provide for that policy. When you go at the process that way, looking at what's the policy, what is the United States of America's role in national security mission globally, today, to protect Americans at home and abroad, or however you want to define it? How do you get that done, what are the tools and capabilities we reasonably have? Then go down into your list of capabilities, and you have to run through a whole bunch of agencies. It is not just the NRO, you have to get into the NSA, and then you have to deal with the customer basis of that, the things that we are counting on, the data that we need for our baseline today that the military and non-military are counting on. When you have figured all of that in, then you begin to understand that it would be nice to have things that we think we can get to to maintain that data base and keep going forward, and the things we ought to be taking a risk on, high expense, high risk,

high commitment, the kind of thing that got the NRO actually going, how much is left to do that.

My view is that if you do not start with the idea of what you want, you are not going to get very far, because you are going to use up all of the money if you start setting the figure.

So the answer is, sure, I can give you a ball park figure, but I would rather not, because I would hate to have anybody throw it back at me——

Senator REED. Right.

Congressman GOSS.—down the road and say that doesn't provide for all of these things.

Senator REED. I infer from your comments that your advisement is to that high-risk——

Congressman GOSS. Yes. I would definitely——

Senator REED.—high-payoff approach, which implies some additional resources.

Congressman GOSS. Yes, absolutely, and I do not want to be misleading or be cute in any way. I believe that the uniqueness, the innovation, the creativity that we have seen in the history of the NRO is its best asset. I think that is what makes it shine out and gives it its special deserved niche among the agencies in the Intelligence Community.

That seems to be the area we ought to nourish the most from Congress, never forgetting that we have now created a dependency with what the NRO has done so far, and we have to serve that dependency.

So, in effect, our success has led us to need more success, because we have an expectation that we can do this stuff, and we have to do it. That is where I am. Yes, it is going to cost something.

Senator REED. Mr. Cox, or anyone else, any response or comment?

Mr. COX. No comments on that.

Senator REED. Let me raise another line of questioning to the panel. Last week we heard from the Space Commission. One of their recommendations was to consolidate acquisition responsibilities and authorities within the Office of the Under Secretary of the Air Force. In your view, does this Space Commission recommendation conflict with any recommendations you have made, and in a more general sense, do you see any differences of opinion or viewpoint with their report and your report?

Congressman GOSS. My quick answer to that is, it could be a conflict or it might not be. It depends on how you get into some of these programs. My view on the acquisition is that you can't load it all up on one person.

The uniqueness that I have spoken to of the NRO, and the testimony that we have had from the other people who have had firsthand experience with it, people like Marty, Larry, and Bill, have an amazing wealth of knowledge about how to make this stuff work best, and what is the most efficient way.

I have listened to them, because they are the best people I know to listen to. The view I come down to is that there are some places where we can consolidate and probably make some switches, and in some cases go to commercial and do some things, and we should be attentive to that, very definitely, but I do not think that the re-

quirement is that we spin off six things this year, because the requirement is that we spin off six things this year. I do not think that is the way this works at all.

So the answer is, I think some of the things the Space Commission was trying to get at, to get their arms around how we use space, and how we get some management involved in it were right, and I embrace them, but some of the particulars of saying fit that exact philosophy into how you run the NRO, it is not a good fit. I do not think it is a conflict, it is just not a good fit. That would be my take.

Senator REED. Thank you.

Mr. Cox, any comment?

Mr. COX. A related comment. I would like to talk for a moment about this thing called systems engineering, because this is the NRO's real strength.

If I may have a moment to describe something tritely: If it is a Saturday morning and you are making breakfast at your home, you start the bacon, you start the potatoes, at a certain time you put the toast in, at a certain time you put the eggs on, and voila, everything arrives at the table ready to eat and warm, and you start into it. That is good systems engineering.

Bad systems engineering is when the bacon arrives, and a few minutes later the toast arrives, and a few minutes later the eggs arrive, and nothing is hot, and nothing is edible. OK?

The NRO does systems engineering in the Intelligence Community unlike any other entity in the world. It is a skill that has been nurtured there for 30 years, through an apprentice system of military and civilian people, working their way up through a system, and becoming the preeminent experts in something, and becoming expert in making their something play with or interface to something adjacent.

Now, that skill, running through programs, can buy your costs down, I would argue and can prove, 15 percent per program, if you do it right up front. It is architectures against requirements, it's technology against requirements, it's bending metal, and building radios, and building optical systems, and all this, in the best way, but according to a set of requirements laid upon an acquisition agency by intelligence agencies, so it is not build the best you can, it is build what you need, and engineered, from beginning to end, in the most efficient manner.

That skill is lacking in the NIMA, NSA, DIA, CIA, even arguably General Motors, and other places. The NRO knows how to do this. That cannot be lost, and that is what is at risk when you start taking certain kinds of things, responsibilities, and performance away from the NRO and trying to parse it out to other places and other agencies.

Senator REED. Thank you very much.

Thank you, Mr. Chairman.

Senator ALLARD. You are welcome.

I now recognize the Senator from New Hampshire.

Senator SMITH. Thank you very much, Mr. Chairman.

Good afternoon, gentlemen. On page 75 of your report, you recommended that the Secretary of Defense and the Director of Central Intelligence develop a strategy that, quote, "Recognizes the

threat posed to the U.S. by the likely availability of commercial space imagery to opponents of the U.S."

Relative to that recommendation, would you support the need for an anti-satellite capability such as KE–ASAT? Anyone? Bill, do you want to—are you the most qualified to answer that, or who is?

Mr. SCHNEIDER. I should preface my remarks first, that even though I am involved with the Secretary of Defense in the transition apparatus, my remarks are as a member of the Commission, and not as a representative of the Department of Defense or the administration.

I think that it is very clear that we need to have an ability to protect our assets in space, and exactly how that is done is an important detail that needs to be managed carefully, whether that needs to be done through an ability to attack satellites or not is a technical question that needs to be resolved, but the overriding issue is to be able to protect our assets in space.

We have a high order of dependence on these assets in space, the NRO, and other satellites that support the Department of Defense and other national security agencies, and the vulnerability of these assets is now well-understood, and needs to be addressed on an urgent basis.

Senator SMITH. In the *Washington Times,* on the 29th of March, General Eberhart was quoted as saying that the United States has a rudimentary anti-satellite weapon on the shelf that could be used in a conflict, but that blowing up satellites is a last-ditch option.

Unless there is something I am not aware of, it is not on the shelf, the only game in town at this point that I am aware of is KE–ASAT to incapacitate a satellite. It does not necessarily blow it up. It could have that capability. It also could be a fly swatter type of thing to disable it, but it is the only game out there.

So I guess the question would be, if you believe in that capability, would it trouble you to know that—well, let me put it this way. We have a program—KE–ASAT is about 90 percent complete, not to brag, but largely because for the last 8 or 9 years I have battled the Clinton administration to keep the funding so that we would have it going, they had taken it out, and line item vetoed it once. We are 90 percent complete. We have appropriated $340 million. We need another $35 million or $40 million to finish it.

Therefore, I guess the question is: Would it trouble you to know that the entire management team of that program has been taken off the program, has been off the program for perhaps as long as 2 years, and that the whole program was being diffused into something else called "space control." Did you run into anything like that, Congressman Goss. You probably have some familiarity with it.

I do not mean to put you on the spot, but it is just—to see the report, which I approve of and support, it is frustrating to see those kinds of recommendations coming forth, and it is one thing to project into the future and say, okay, let us move along on these recommendations that you make, and let us try to do something, but it is more frustrating to know that we have the capability, and we have been thwarting that capability for the last 8 or 9 years, and still are thwarting it even to this day.

Congressman GOSS. Senator Smith, thank you. I am going to follow-on to the answer I gave to Mr. Reed, in part, and that is that I believe policy has to drive expenditure.

I think that when we have the clear policy about what our national security looks like and what our policy is, how we define it, who we are, and the globe as it is today, with the threats that are out there for the United States and its citizens, whether they are here or abroad, the capabilities that we spend money on to provide them the greatest degree of protection is the issue, and I do not think you can make intelligent decisions about money until you go through that process.

Unfortunately, we have not gone through that process in this country in quite a while. We need to do it. Certainly, not since the wall has come down has a calculated, clear, comprehensive focus come out about the policy of the United States of America and the globe today. Consequently, our friends are a little puzzled, our enemies are a little puzzled, and we are not making some of the decisions we should be.

I am in full agreement with you that we have not fully taken advantage of all the opportunities we have to deal with space, how it is used as a medium to protect and enhance Americans and enhance our national security interests there. It is big ticket when you talk about space, it is big risk, all of these things.

Mr. Reed, you are welcome to all of the numbers that I have. When I said I do not want to give you any numbers, publicly, that was the reason, as a member, you are certainly welcome to all the numbers we have, and we will provide you with all the numbers we have, and you will probably come to the same conclusion that I have, is that we have tradeoffs to make. That is the problem, Mr. Smith, we have tradeoffs to make.

The good work of the Space Commission Report, in my view, is that it has brought attention to the fact that there is something out there called space, and it matters to us, and we have to start setting up some rules of understanding of how we utilize space. Right now, our biggest worry, honestly, is not how to take weapons out of space, it is how to make them work. I am more worried about fragility than I am exposure in space right now.

Senator SMITH. One other quick thing, Mr. Chairman, and thank you for that answer, Congressman Goss. Senator Inhofe is not here, and it does not look like he is going to be here. He wrote a letter to the President regarding a separate security compartment, the issue of controlling outside knowledge for our most advanced capabilities and expertise, and a lot of members of Congress have been very concerned about it, specifically, the takeover of SVG, the Silicon Valley Group, by a Dutch company.

We understand the technological leadership of that country, but what do you think of the issue of technology transfer of that kind of capability and the impact that that might have on our own separate security compartment?

Congressman GOSS. Technology transfer is a subject that we are becoming more engaged in every day. I think the Cox Commission report, with the Chinese transfer question, opened up this idea and the question of—Hutchison went to Panama, added to it. We have had examples of this manifestation thrown at us.

I think it is a vigilance question, and I think you have to take it a case at a time, and I would certainly yield to any one of these gentlemen who have direct experience dealing with the kind of brilliant brains and consortiums that put this stuff together that we end up using.

Senator SMITH. Marty.

Mr. FAGA. As long ago as 10 years, when I was Director of the NRO, the electronic componetry that was going into satellites was increasingly either foreign sourced or companies under foreign control, certainly a matter of concern then and now. A practical problem that we have discovered, that comes back to something that Mr. Goss has said time and time again, was that we would go to companies that we understood were going to sell and say, "How could we help you keep this in your own hands," specialty parts, ownership, whatever it might have been.

The problem would be the cost would be so high, the government would effectively have to take over a plant and own it, which in very few cases it did do for very specialty products, for example, materials for rocket cases, but in the general case of electronics, it was not possible.

Now, we do have vehicles for dealing with companies that come under foreign control, where there is a special board of U.S. persons who regulate their defense activities.

As far as I can tell, and my experience is a little bit now, that worked fairly well, but the problem preventing the kind of thing that you are worried about, and that I worry about, is it costs a lot of money, that we, in the end, choose not to put into it.

Senator SMITH. Bill.

Mr. SCHNEIDER. One additional point on that, Senator. I participated in a study that was done by the Defense Science Board on the impact of the globalization phenomena on the Department of Defense, and one of the problems that is emerging, of which the case you mentioned is a good illustration, is that the technology base that is used to create military capabilities is now largely external to the Department of Defense or the defense establishment.

That is, most of the capabilities, for example, in information technology that are the underlying or enabling technologies are created in the civilian sector, and the defense industry is finding clever and even ingenious ways of taking this technology base that is available to our adversaries as well as our allies and are creating advanced capabilities from that.

As Marty suggested, the problem of course of trying to maintain a technology development base within the defense establishment to create exotic microprocessors, for example, would be very difficult and extremely costly. So what we have been trying to do is find ways in which we can protect the knowledge that assembles these widely available technologies in ways that prevent competitors from creating countervailing capabilities.

If it would be of interest, I would be glad to provide a copy of the Defense Science Board study on this phenomena to see what the state of thinking is on it.

Senator SMITH. Let me call on the Senator from Florida.

Senator BILL NELSON. Thank you, Mr. Chairman. I just want to say, we are very proud in Florida to have Congressman Goss, who

has given leadership in the House, indeed, the country, on these matters of intelligence, and are very appreciative that is a Florida product to the nation.

I have just two questions. First of all, I would like you to address our vulnerabilities with regard to launch vehicles.

Mr. COX. I think I should deal with it. There is a terrorizing date, not too distant in the future, where U.S. intelligence, new-generation U.S. intelligence capability will be relying on brand new boosters. It was not planned to happen that way.

I think the NRO had a very good plan in conjunction with the Air Force to let commercial industry test a whole class of new EELV boosters on Teledesic, and Iridium, and some of the other multi-launch communication systems that were destined to go up in the early 21st century, most of which will not occur now for business reasons.

That leaves the government as the alpha-beta test site for all these new launchers. So we have the unhappy situation of brand new block change, state-of-the-art intelligence vehicles going up on brand new state-of-the-art untested boosters. If I had a clever way to solve that problem, my company would go up by a hundred times in the next couple of years, but I do not.

We can be diligent, we can inspect, and reinspect, but designs just take time to mature. We can expect some significant launch failures, and the NRO has not been funded to the levels required to create vehicle redundancy to survive a lot of failures, perhaps not even a few failures.

There has just not been enough money to build all the vehicles required to satisfy the requirements and accept the potential loss of boosters, which will not allow them to achieve orbit. It is the long way of saying that there is a difficult time coming.

Senator BILL NELSON. As much as I do not want to suggest this, because we completely changed our launch vehicle policy in the aftermath of the Challenger explosion, are we, because of what you just said, designing our payloads so that we would have a backup of the space shuttle?

Mr. COX. No. As a matter of policy, we are not. There was a policy to put all of these launches on the space shuttle, and then after the Challenger the policy was to remove them from the space shuttle program, and the cost to the government was very high to do that. It was an inevitable thing to do, and that is where we remain today, booster bound.

Senator BILL NELSON. I take it that any of the existing launch vehicles then are not also a backup.

Mr. COX. They are mostly going to be used up by the time the new-generation vehicles will be ready, and they are also over capacity for the requirements of the new-generation vehicle.

The whole thrust has been to downsize, miniaturize, make them lighter, because the cost per pound to space is a formidable thing, and so every effort has been made to reduce the weight into space, and, therefore, the size of the booster, and it has cut costs by more than half.

Senator BILL NELSON. If national security is riding on having assets in space, and we have this potential failure ahead of us, what

should we be providing in order to have a backup, given the gravity of the situation?

Mr. COX. The opinion is that we should have some redundancy in our vehicles, in our intelligence collection vehicles, and some redundancy in our boosters. We have historical evidence of approximately what the reliability of new classes of boosters are, what their reliability is, and we should use that, whatever, 15 percent, 20 percent failure rate as a predictor about how many vehicles should be in the barn, anticipating failure.

Senator BILL NELSON. Vehicles in the barn, you are talking about existing vehicles as backups.

Mr. COX. I am talking really about manufacturing more new-generation vehicles.

Senator BILL NELSON. Even though you might have a failure?

Mr. COX. I think the failure is more likely to be booster failure than an intelligence collection vehicle failure. The probability of failure of intelligence collection vehicles is very low. I worry more about new classes of boosters.

Senator BILL NELSON. Sure, and that's what I am referring to.

Mr. COX. Yes.

Senator BILL NELSON. So you have more vehicles in the barn in order to get your payloads up.

Mr. COX. Yes.

Senator BILL NELSON. All right. Now, are you talking about the new vehicles, or the old vehicles?

Mr. COX. New collection vehicles.

Mr. FAGA. Take your losses, and pick up, and go on.

Mr. COX. Yes. Just continue with new-generation—and there is another advantage to that. We typically manufacture these vehicles at a very low production rate, which drives costs up. If we could manufacture at a slightly higher rate, it would drive costs down.

Senator BILL NELSON. Right.

Mr. COX. The difference between a Porsche and a Ferrari.

Senator BILL NELSON. So you feel that the new boosters are going to be reliable enough, and if we had a failure, you have more in the barn, you're going to get your payload up, is that what you are saying?

Mr. FAGA. You don't really have a choice. The immediate thought of, why not put some of them back on shuttle, or do a compatible with shuttle, or——

Senator BILL NELSON. Or existing expendable launch vehicles.

Mr. FAGA.—Atlases, or Titans that were going to be around. Every satellite is designed for the boosters that it will face, particularly the mechanical loads, but also the electrical, and so on. It is a very big deal.

I was involved directly in the business when we were moving off the shuttle back to expendables, but the cost ran into the billions, given that we also took the opportunity to modernize the vehicle at the same time.

If one suffered losses and then said, things are not going well, let us shift back to the shuttle or the Titan, it would be almost impossible in both terms of time and in cost, so that what Larry and I have been saying here is, if you take losses due to the immaturity

of a new launch vehicle, you will have to find out what was wrong, put another payload on top of the next one, and go.

Senator BILL NELSON. Can you quantify for us in your recommendation what kind of budgetary increase we ought to provide, and we are just talking about one little aspect of your report, we are talking about additional launch vehicles, but if you expanded that to talk about the robustness of what we need for our reconnaissance and security of the country, how many billions of dollars additional are we talking about?

Mr. FAGA. I do not think we know the answer in dollar terms.

Mr. COX. It is nice to know that these vehicles are also useable by commercial industry, so if government procured too many, government could make them available to commercial industry for the price of development, the price of purchase. They are not unique any more to intelligence community needs. They are useful in a lot of needs.

Senator BILL NELSON. Mr. Chairman, I have to go to the floor on the budget resolution. As you get further into the discussion, I wish you would give us an idea, as we prepare for markup about what kind of additional funding that we are going to need to prepare, not just for what we have been talking about here, launch vehicles, but the overall reconnaissance effort.

Senator ALLARD. We will start with the second round. We should have a vote on the floor at any moment here, so I will start the round, and we will see how far we get. The Commission on Space, as well as the NRO, had some similarities in their report, in fact, NIMA also had some similarities, all three of them had some similarities, but the Space Commission went a little bit further, and they suggested that this organization include other collections, such as airborne, and surface, and subsurface, to focus on integrated approach, that was their suggestion, integrated approach and advance collection testing. What is your reaction to this broader, but overlapping post?

Mr. FAGA. Mr. Chairman, my view is that integration of these various forms of reconnaissance is absolutely essential. In fact, pulling together all forms of collections, being able to process them in some common way, and provide data back to users, particularly operational users who are perhaps far afield and operating on a short time line, is the biggest improvement in this business that we can make in the next several years. It is absolutely vital.

Senator ALLARD. Larry, do you want to elaborate on that?

Mr. COX. This is an opportunity to expand the NRO systems engineering role yet more broadly, giving an opportunity to perform that kind of function across more than just space alone, because that really is an engineering discipline, not an NRO discipline. It just happens that the NRO has developed it as an integral part of the way that they do business.

Senator ALLARD. Let me move on to the question involving commercial imagery. I know we had a lot of discussion there about commercial imagery, and the other reports also talked about commercial imagery. In your view, is there a role for commercial imagery as we seek to modernize, and streamline, and revitalize the imagery intelligence system? Bill?

Mr. SCHNEIDER. I think that the Commission concluded that there was a role for commercial imagery, and that finding was affirmed in both the NIMA and the Space Commission reports.

As I had mentioned earlier in my testimony, the fusion of space-based imagery technology to the commercial sector will enable the commercial sector to provide a large part of the, call it commodity images that the U.S. Government requires for things like mapping and so forth, that do not require the extraordinarily high degree of resolution that is possible from government systems.

On the other hand, we have a range of very difficult targets that are related to our national security concerns, where the NRO's capabilities are irreplaceable, and the Commission concluded, and I believe it strongly myself, that we should try and get the commercial sector to be able to pick up as much of this commodity imagery as possible, so that the resources and human capital in the NRO can focus on resolving these very difficult problems we have.

Senator ALLARD. I think you have reopened a point on half-meter; hence, more possibility. I think you used the——

Mr. SCHNEIDER. That is correct. There is a substantial increase in opportunities created by moving to half-meter imagery, and it happens that also there may be quite a few interesting commercial applications from half-meter imagery that will contribute to the establishment of a robust commercial space reconnaissance industry that the U.S. Government can draw upon as can our industry.

Senator ALLARD. Larry.

Mr. COX. I think we all agree that there is a significant role for commercial imagery in support of the U.S. Intelligence Community. I worry a bit whether we will have one, whether we will have a commercial imagery community. The business cases just do not close very easily, and the reason is, the front-end investment in spacecraft to do one meter, let alone half-meter imagery, is huge.

This is an area where the U.S. Government has been very effective in having deep enough pockets to invest in the R&D required and the manufacturing required to build the kind of vehicles that can perform at those levels. Commercial industry needs a significant return on its investment in a relatively short period of time to make this a viable industry, and I frankly do not see it closing at this point.

Senator ALLARD. So Congress could do the——

Mr. COX. There probably is—there have been lots of ideas floated. In fact, Congress has supported numerous efforts to buy commercial imagery by providing for money for NIMA to make the procurement, but as far as how to stimulate the development of the complex and more costly imaging systems for commercial industry, they have not received much help yet, and I am not sure how you do that short of a subsidy.

Now, you could look back in time 6 years and say, well, perhaps the government could have made imagery from U.S. intelligence systems available to commercial imagery, just so long as it was of a resolution that was acceptable for release, and let commercial imagery build a product market, but that did not happen, and now we are half a decade too late, I fear. So I think we are still open to clever approaches on how to help the industry.

Senator ALLARD. Bill.

Mr. SCHNEIDER. If I may just add a point there. I do not believe the industry needs a subsidy, but there clearly is a large set of U.S. Government requirements that can be satisfied by half-meter imagery. The underlying problem, and as referred to briefly in the NRO Commission Report, is the pricing mechanism that exists within the government, where commercial imagery has to be paid for by a prospective user, say a theater commander, whereas government imagery is free, and it is free only in the sense that there are no explicit charges levied.

In fact, government imagery is more expensive than commercial imagery, but because the pricing mechanism does not allow those signals to be transmitted to the user, there is not a good way to deal with it.

So one of the ways that might be worthy of further exploration is to examine areas where the U.S. Government users, whose needs can be satisfied by, say, one meter or half-meter imagery, would be obliged to procure in the commercial sector.

That ultimately will ripple back into the way in which requirements are generated so that as satellites are designed that they will intend to embody capabilities that are addressed only by the government sector, and the commercial sector can focus on areas where it has a value added and can do so at the lowest cost to the taxpayer.

Senator ALLARD. My time has expired. I turn to Senator Reed, if you have any questions.

Senator REED. Thank you, Mr. Chairman. Senator Nelson's line of questioning led, I think, to my first question, which is, how much will this all cost us, but let me just go back to his example, which I think is a very good one. The boosters that we are talking about, I presume these are unbuilt and unbudgeted. They are future requirements.

Mr. FAGA. Oh, no, they are budgeted.

Senator REED. They are budgeted?

Mr. FAGA. In fact, they are being built. They are under construction.

Senator REED. What is the price tag for those?

Mr. FAGA. It is $200 million.

Senator REED. I would imagine. $200 million? That is——

Mr. FAGA. It is $200 million per.

Senator REED. It is $200 million per?

Mr. FAGA. Each.

Senator REED. How many would you, again, at this juncture, feel comfortable that would be necessary to build?

Mr. FAGA. Well, you would want to build, of course, one for each payload you planned to launch, plus a couple of extra, so that you could quickly respond to problems that arise. If you never have an accident, it ends up costing no more in the long run. Of course, in the short run, it does, and the short-run budget is always a problem. The same thing on the payload side.

By the way, we used to do this. When I first got involved in the NRO in the late 1950s, we had spare vehicles, payloads.

Senator REED. Looking ahead for 5 years, additional resources beyond that which has been appropriated, if it is $200 million a copy, what is your best estimate of how much the total cost would

be for just these boosters? $5 million? $10 million? $2 billion? $1 billion?

Mr. FAGA. It would be a couple launch vehicles and an extra of each of the key payloads we are worried about protecting.

Senator REED. 115 percent of what you need.

Senator ALLARD. Senator Reed, part of the answer to your question is that there has been a cost cap again——

Senator REED. Yes.

Senator ALLARD. —and this cost cap has some impact on how much they can spend on——

Senator REED. Again, these are complicated issues, but if you could give us a best estimate of the presently budgeted costs and the future costs that are not budgeted, that would be helpful. Let me thank you, Mr. Chairman, for your clarification.

Let me move to another issue, and that is that the Commission recommends that the NRO should supply systems engineering capabilities and transfer space systems technology to airborne applications. The NRO has particular expertise that we all recognize that may be to the benefit to the rest of the nation's intelligence question efforts. However, these outreach efforts, if not managed properly, may lead to diluting the focus and the efforts of the special expertise of the NRO.

Do you have any concerns that moving this in this direction would dilute the NRO efforts or to undercut what they are best at? Larry.

Mr. COX. I actually lived with that problem when I was Director from 1989 to 1993, because we had certain forms of strategic airborne reconnaissance in the NRO. Frankly, it did not work well, because it did dilute our efforts, and we were also suspect as stewards of airborne reconnaissance, as opposed to satellites, and subsequently, the Clinton administration established the Defense Airborne Reconnaissance Office, which has now since been disestablished.

The idea here, however, was not take over management of these programs, but to recognize that there is technology in the NRO that needs to feed into mostly high-altitude, high-endurance programs. I think that is very real, and the integration of these capabilities, as we were just discussing a couple of minutes ago, is essential. I think in that arena the NRO can help.

I am not too worried about the NRO having its capabilities dissipated, so long as it is basically on target, that is, it is about doing reconnaissance, whether it is helping someone with NIMA and TPED, or airborne integration of space-borne capabilities, that is, miniaturized receivers, whatever it may be. I think it can handle that.

Senator ALLARD. Thank you. One of the other recommendations that the Commission made was a balanced response to customer demands, specifically recommending that customers be properly trained to understand the real cost of NRO support.

In the requirements of future imagery architecture, the DOD officials were involved in the tradeoff process. Is that the type of insight to NRO costs that you would see as being beneficial, and you had in mind, in terms of making a recommendation about essentially educating the customers?

Mr. FAGA. We thought it was important for users to understand that asking for single images, asking for several thousand dollars worth of collection, and this is repeated thousands of times a day, that the costs are huge. I have always said a bit tongue-in-cheek that these systems are built to at least a square's fit of whatever users dreamed up that they may want.

That is, there is really nothing to restrain users making requests, and because it is a limited good, the way the game is played is, throw in extra requirements, because, gosh, maybe I will get some of them fulfilled.

Senator REED. So you are still uncomfortable about the demands and the system for putting demands on NRO assets, the way it is allocated now.

Mr. FAGA. The system does not recognize the costs. That was the point that Bill was getting at, in fact, he might like to comment further on it.

Mr. SCHNEIDER. The phenomena is predictable when you do not have a pricing system that the demands are not there. Of course, government work is not a market situation, and so some proxy needs to be found to rationalize the relationship between them.

We have had this problem episodically in other areas of the defense establishment, and perhaps there may be some concepts that can be derived from it. For example, in providing a military airlift, there are basically two ways you can do it.

You can do it with specialized dedicated military aircraft, a C–17, or you can put it on a 747, and if you are going to fly it to Rhein Main, in Germany, it is probably better to fly the freight on the 747, but if you are going to take it into a contested area, you are better off using a C–17, but if the military user does not have a way of distinguishing by price signals, or some similar metric, between whether he should ask for a C–17 or a 747, the chances are that they may make an irrational choice. So there has been an industrial funding approach taken to the military airlift problem as a way of managing the absence of a true pricing mechanism.

In the NRO Commission Report, we have some language suggesting that perhaps that might be an approach that could be examined to rationalize the cost of the assets to the U.S. Government.

Senator REED. Thank you.

Mr. Cox.

Mr. COX. Gentlemen, these requirements laid on the modern intelligence systems are the result of the most successful education campaign in history, at the high end. Starting in 1978, the military, with the help of Congress, created the TENCAP program to educate military users about how to use national systems in a more effective way for combat support, so intelligence systems came from behind the green door for the first time, and now every military officer, as part of his normal intelligence module and training, learns about national systems, to the level required, to make them effective devices for his use as a battlefield commander.

So we promulgated across our military services thousands and thousands of people who understand how to use these systems very well. They are going to use these systems very well.

They are going to insist on these products to improve their performance in the battlefield, to improve their planning, to improve

their logistics, so we should be delighted, as intelligence professionals, that they now understand what we do and why, but we also need them to understand how to help manage the faucet of the flow of requirements in, and, therefore, the products out to those users, and that has not taken place in the same effective way.

Senator REED. Thank you very much.

Thank you, Mr. Chairman.

Senator ALLARD. Senator Reed, unless you have any other questions——

Senator REED. No, I do not.

Senator ALLARD.—I will proceed on to the next panel.

I want to thank this panel for their time and dedication, and putting together a report, and then testifying before this subcommittee, and Congressman Goss, it is good to see you. Thank you.

Congressman GOSS. Thank you, Mr. Chairman, very much.

Mr. Reed, I will be very happy to provide you with the exact numbers of the NRO budget, and any other program you want.

Senator REED. Thank you very much.

Congressman GOSS.—and to help you settle the question.

Senator REED. In a few weeks, you can give it to me on the plane. [Laughter.]

Congressman GOSS. Thank you.

Senator ALLARD. Let me go ahead and call the second panel. This is the Independent Commission on the National Imagery and Mapping Agency.

Chairman Marino, we will start with you. I would ask that you introduce your panel.

Mr. MARINO. OK. I will be happy to do that.

Senator ALLARD.—and it will give them the opportunity to be recognized, and then your Executive Secretary, Mr. O'Connell is here, so Mr. Marino, if you will proceed.

**STATEMENT OF PETER MARINO, CHAIRMAN, INDEPENDENT COMMISSION ON THE NATIONAL IMAGERY AND MAPPING AGENCY; ACCOMPANIED BY EVAN HINEMAN AND GEN. TOM WEINSTEIN**

Mr. MARINO. Thank you, Mr. Chairman, and distinguished members. It is our pleasure to appear before the subcommittee to report on the findings and recommendations of the Independent Commission on the National Imagery and Mapping Agency.

I would like to introduce my fellow witnesses today. I have Mr. Evan Hineman, a former Deputy Director of CIA's Directorate of Science and Technology, and Director of Program B in the NRO. He is at the far left-end of the table. Evan is currently the Vice President of Intelligence with Northrop Grumman.

I am also joined by retired General Tom Weinstein, a former Deputy Chief of Staff of the Army for Intelligence, currently a Senior Vice President of Electronic Warfare Associates; and Mr. O'Connell, our Commission Staff Director, is from the Rand Corporation. He is also with us, and he will be making a presentation shortly.

The NIMA Commission is a commission which I am very proud of. For almost 10 months, our nine commissioners, drawn with a rich set of government and industry experience, worked hard to un-

derstand NIMA, including its management and organization, technology, development, and acquisition strategies, and business practices. They focused on NIMA's large, diverse customer base to understand where NIMA is performing well and might perform better.

The Commission also endeavored to analyze and understand NIMA's future, whether it was to critically assess NIMA's future vision or to suggest other paths that might be more wisely taken. NIMA has been studied quite a bit by commissions and task forces in the past couple of years. In fact, this is the second group that I have chaired in the organization in recent years. Prior to this one, I chaired a Defense Science Board task force looking at NIMA as well.

Our Commission, at the end of the day, provided 18 findings and 23 recommendations to the DCI, Secretary of Defense, and the NIMA leadership on how to improve NIMA. Though NIMA has taken many of our suggestions to heart, we are hopeful that we will soon see some additional action on the recommendations directed at the Intelligence Community and the Department of Defense.

Up until 3 years ago, it could be argued that NIMA was a dysfunctional organization. It is the Commission's feeling that Lieutenant James King, NIMA's current director, has done an excellent job under difficult conditions, particularly in his effort in understanding the need to merge two separate cultures and the need to modernize and consolidate, even though the resources to do so have been limited and sometimes restricted, in terms of what the organization could spend.

However, NIMA has a considerable way to go. For example, continuing to integrate the various cultures within NIMA is a job yet unfinished. To loosen its strong dependency on legacy systems is something that NIMA needs to get on with. To build up its systems engineering and acquisition expertise is absolutely vital to its future. To develop a commercial imagery strategy is not only important to NIMA and to the Department of Defense and the Intelligence Community, but also important to just the nation as a whole.

The need to integrate satellite, airborne, commercial, and other sources of imagery, and geospatial information system (GIS) data into a more innovative slate of intelligence and map products, is something that also needs to be done, and needs to be done expeditiously.

Today, I have asked Mr. O'Connell to brief you on some of the major themes considered by the Commission that might be of specific interest to this subcommittee. As he begins with this, I would ask you to keep three major themes in mind.

1. The time has come for the DOD and the Intelligence Community to move from being collection centric, to focus on processing and exploitation. With at least some of the traditional intelligence sources becoming available to our adversaries and others, it is essential that we focus on the value-added processing and dissemination of intelligence information to the people who need it, particularly in this era of fear.

2. NIMA's attempts to modernize can only come from improved interactions with the commercial world. Use of an emerging commercial remote sensing sector can provide innovation and opportunities for NIMA to go up-market in the imagery business. Increased out-sourcing of NIMA's Legacy products and services can help transform NIMA, while ensuring customer support for a wide range of customers, and TPED must benefit from continuing developments within the commercial technology area. TPED is a subject that I am sure we will talk about later, and something that the Commission had quite a bit to say about.

3. Finally, the people—finally, people are NIMA's key assets. NIMA must continue to pursue highly skilled managers and workforces, especially in technical areas, and particularly in the systems engineering area, an area where we believe not only NIMA, but most of the U.S. Government is greatly deficient in.

So we look forward to your questions, and I will turn it over to Kevin to have him review for you the findings and the recommendations.

Senator ALLARD. Thank you.

**STATEMENT OF KEVIN O'CONNELL, EXECUTIVE SECRETARY, INDEPENDENT COMMISSION ON THE NATIONAL IMAGERY AND MAPPING AGENCY**

Mr. O'CONNELL. Thank you, Peter.

Mr. Chairman and distinguished members, with your permission I will take about 15 minutes and run through some key findings and recommendations of the Commission, and I will submit this entire briefing for the record.

The NIMA Commission was established in the Fiscal Year 2000 DOD Appropriations Act. We were given a broad mandate, and requested to undertake a very broad look at NIMA, everything ranging from its business practices, its technology and acquisition practices, and its organizational and management structure, and we undertook that, as well as the operations support provided by NIMA to the Department of Defense and the Intelligence Community.

This, in fact, was our Commission membership. As you can see, we have wide representation from the Central Intelligence Agency, from U.S. industry, and from the Department of Defense.

In terms of our broadest findings, we found NIMA to be a very important, a vital, but sometimes under-appreciated organization in the U.S. Intelligence Community. We believe, as a Commission, that the debate about NIMA as an organization is over.

One of the senses that we had was that, in spite of its critical importance to U.S. information dominance, that NIMA was widely underfunded, and in particular on the issue of TPED, and I will speak to that in a couple of moments, but also in other critical areas like research and development, and, in particular, in the training areas, to develop the kinds of people that Peter has spoken about.

Finally, there were many parallels made during the Commission's tenure to the role of the director of NIMA as the functional imagery manager for the U.S. Government, in essence, to manage sources of imagery, ranging from satellite data, airport data, com-

mercial imagery sources that are purchased for the U.S. Intelligence Community and defense community, and others, and we think that this is still a role which is not being fulfilled to its fullest by the director of NIMA.

We believe that the director should have more leverage over all the imagery and geospatial—these sources that are expended within the defense community.

I just wanted to spotlight three issues today, three big issues for the Commission, that we looked into with some detail. The first is what was known at the time as the national-versus-tactical debate, in essence, the question that was thrust upon us as to whether or not NIMA was overly supporting military customers at the expense of strategic intelligence customers, CIA and DIA, for example.

The Commission endeavored in many different ways to try to understand this problem. It was complex. Our first sense of this was that this characterization of national-versus-tactical was largely unhealthful. There is a section in our report titled, "Time to Turn Down the Heat." Rather, we saw a wide range of intelligence customers that were dealing with strategic, operational, and tactical questions every single day of their existence.

We did find, though, that there was a broader set of trends that this problem was reflected in that needed some attention. One was the overall resource question, not only of resources, not only in dollar terms, but also in terms of the kinds of capabilities that exist to attack various kinds of intelligence problems.

The second problem we identified is that generally within U.S. intelligence there has been a shift to a much more short-term focus, rather than a long-term focus, and this is the way we chose to characterize the problem. At the end of the day, we could not pin this particular problem on NIMA. Rather, there were a number of places in the imagery tasking process where NIMA could do a better job as facilitator and as a manager, but we could not pin it directly on them.

We found also anecdotally that the extent to which customers and collectors had more and more communications, if you will, more dynamic communication, they had a better chance of satisfying the wider slate of deeds that were being stated throughout the community.

The Commission's recommendations were as follows, to maintain the traditional DCI oversight of the tasking process in peacetime. We also encouraged the shift of 300 analysts from the cartography field to imagery analysis by the director of NIMA, with an emphasis on keeping those people focused on long-term imagery analysis.

We encouraged NIMA to facilitate the tasking process and to facilitate communication and collaboration within that process, and finally, to improve communications between the taskers and the customers out in the imagery and the all-source community.

The second big issue that we dealt with was this issue of TPED. Of course, TPED stands for tasking, processing, exploitation, and dissemination. In some ways, this was the most fundamental question that the Commission was asked to address.

What is it? Is NIMA sufficiently able to acquire, is there sufficient funding to acquire TPED? In particular, is it related to the future imagery architecture time frame?

As Peter has previously indicated, one of our strongest concerns was that the community remains collection-focused, and has not emphasized end-to-end planning for FIA, for other kinds of collection sources, in terms of how we will exploit the data and get it to the people that need them. We were not confident in NIMA's ability to acquire TPED in the short run for a variety of reasons.

There was lack of architectural planning that we believe is now underway, a general lack of systems acquisition skills, and the need for fundamentally new approaches, in particular, based on commercial technology that could support TPED.

We believe that the cost of TPED in the current program is significantly underestimated, and finally, we think that there must be a plan for TPED that integrates not only satellite data, but airborne and commercial sources, and other sources of imagery data as well.

Our recommendations emphasized, first and foremost, the need for the community leadership to seek the means, the sources, to provide NIMA the ability to make its mission goals, as we say, and to make its infrastructure functional in support of TPED.

We also recommended that the Director of Central Intelligence and the Secretary of Defense help create what we called the Extraordinary Program Office, in particular, to ensure the prompt and efficient delivery of TPED functionality and capabilities.

Finally, we requested that the National Security leadership form a plan which did, in fact, integrate satellite, airborne, and commercial sources of data.

Other recommendations in this regard were to improve NIMA's research and development related to this problem, including the naming of the chief technology officer, proactive thinking by the director of NIMA, in terms of the fee upgrades that are planned, in particular, those where the JCS has identified shortfalls in the TPED process, and then finally, the director of NIMA should have a technical advisory panel to respond to specific TPED requirements, and oversee those as they develop.

The third and final big issue that we wanted to talk about today was the slate of NIMA's interactions with the commercial world. The Commission undertook an extensive set of discussions and deliberations about this.

Within this category, we included everything from the commercial imagery strategy that NIMA has with the NRO, to its outsourcing strategy, to the use of commercial technology, in particular within TPED, and then finally, commercial practices, in essence, what NIMA's relations are with U.S. industry.

I will go through those individually. On the commercial imagery side, we believe that the U.S. commercial remote sensing strategy has been very poorly implemented. We are nowhere today where we envisioned we would be in 1994 at the signing of PDD–23.

Second, we found with some complex analysis that, even in the FIA era, there would be a reliance for both peacetime and wartime scenarios on airborne and commercial sources of imagery data that is inconsistent with the planning and investments that are being made today.

Finally, the specific NRO commercial imagery strategy, essentially, the commitment that has been made in the last couple of years has gone unfulfilled.

With regard to the outsourcing strategy, one of the tensions that the Commission considered to be the greatest for NIMA was the tension between the need to modernize and the need to provide a traditional slate of products to the customer base. It is over 250, by one count.

One of the methods by which we believe NIMA can actually help do this in a more efficient manner is by outsourcing a significant amount of products and services to the private sector, and the record so far has been good, but spotty, as industry described it to this Commission.

On the question of commercial technology, we do not believe that the TPED itself is a major hardware system. Rather, we believe that there must be a provision for rapid technology insertion for the kinds of technologies that are coming out of the commercial sector, and image processing, computing, et cetera, that will allow NIMA to be more effective in its TPED processes.

We also felt that NIMA had to push analytic tools down to the user, simply because of the nature of the intelligence business these days, the extent to which it is more chaotic, and users, customers, and analysts needed to have access to a wider slate of tools.

Finally, in the commercial practices case, we found industry somewhat frustrated with NIMA, and described them as a unreliable partner at times. We know this has been a point of emphasis within NIMA in recent months, and we hope that they continue along that path.

Finally, the Commission recommended in two areas the commercial imagery strategy and the outsourcing strategy, that both of these be redone, preferably within about a 6-month period. We also believe that the Secretary of Defense should establish a fund from which commercial imagery purchases could be made by defense elements.

We recommended a fund of about $350 million be done there, so that defense customers, who were caught in that same trade that I believe Dr. Schneider was talking about, NRO imagery for free, versus commercial imagery at cost, they would not have to make that trade in such a difficult fashion.

Finally, as I said, we had requested that the outsourcing strategy itself be redone in order to maximize outsourcing a variety of products and services that NIMA has been providing on its own in its early years.

Anyway, on that note, I think we will stop, and will allow questions.

Senator ALLARD. Do any other members of the Commission want to make any comments?

Mr. MARINO. Well, the only other comment I would make about commercial imagery is that there are strategies, we believe, that the U.S. Government ought to take that could help invigorate or jump-start the U.S. commercial imagery business.

I do not think that the Commission believes it is healthy for commercial satellite capabilities not to be dominated by U.S. industry,

but, in fact, be dominated by foreign industry, because we somehow have let our U.S. commercial satellite industry die on the vine, because we cannot come up with a plan, a U.S. Government plan, to understand how it can support this industry without subsidizing it.

One of the suggestions that we kicked around within, and I am going back to one of the questions that was asked of the NRO Commission, one of the ideas that was kicked around at the NIMA Commission hearings was that the U.S. Government, if it could see itself buying a certain amount of imagery per year from a commercial company against spec, and telling the commercial company that if you are able to deliver an image with this amount of resolution, with this kind of spec, we will buy, say, this is hypothetical, $30 million a year for a certain period of years. That is the kind of plan that they could take up to Wall Street, and actually get equity or financing for their company. That gets the half-meter satellite, the money for the half-meter satellite built, and it also gets the industry on a path that at least it looks like it can do some business in the future. But I think there are strategies to do it. I do not know if that is the best one, but that is a strategy.

The second thing I would say about the $350 million recommendation, $350 million from the Secretary of Defense's office, that was actually a recommendation made by John White to us, which we thought was a very good recommendation. It had to do as much with the fact that the NRO imagery here is free, and to buy commercial imagery, the services have to trade bullets against imagery, and that is a difficult tradeoff for them to make, but secondarily, the other advantage that commercial imagery has, if the services had access to buy it, is that it is unclassified, and gives them a lot more flexibility in dealing with coalition forces.

Right now, it is very difficult for them to share national technical means imagery with coalition forces. Commercial imagery, by its very nature, being unclassified, is not a problem, so there is, we believe, a pent-up demand in the Defense Department for commercial imagery, and, therefore, we think it's almost imperative that we get on with trying to figure out how to make this work.

Senator ALLARD. Again, there was a lot of discussion in 1996, when the NIMA was set up, as to whether we were creating a good organization or not, and concerns about whether we were just stove piping, and whether this would inhibit integration. I gather from your comments that you think that it was a wise move.

Mr. MARINO. No. I think Kevin's comment was that we do not think that revisiting that issue, because it creates such emotion in the Intelligence Community and in the Defense Department, is healthy. What we think is healthy for NIMA is to get on with it.

We do not think it will ever be broken up and put back to the way it was. We do not think putting it back to the way it was in this environment makes a whole lot of sense, and continuing to discuss that issue, which is an issue that some people liked to discuss a lot, it does not help NIMA get on with its job. It just reopens old wounds.

Senator ALLARD. Good or bad, your point is.

Mr. MARINO. We are where we are. We are where we are. That's right.

Senator ALLARD. Make it work, in other words.

Mr. MARINO. Right. That is good.

Senator ALLARD. I also gathered from your testimony that you think that TPED is more of a money problem than an organizational problem. Does it have some organization problems?

Mr. MARINO. Yes. Big ones. From our perspective, TPED is a multi-dimensional problem. A very significant part of that problem is that the right kinds of people to do a system like TPED have the characteristics that Larry Cox talked about a little earlier. They are called systems engineers, and systems acquisition people.

NIMA, in the merging of the cultures of DMA and NPIC, brought together two organizations, neither one of which had that expertise at all. They have been trying to build that expertise, but that is a very difficult resource to build.

Even the NRO today is not the same systems engineering element that it was 10 years ago. I mean those people—systems engineers, in general, are very difficult pieces to come by, and when you come by them, you like to hold onto them, but they attract high salaries in industry, and they leave for industry. So for NIMA to build up that capability is a very difficult job.

So not having a good systems engineering systems acquisition capability impedes getting on with TPED. You compound that problem by not funding TPED to the level that it needs to be funded, and I think what you are creating is a recipe for disaster for the day when FIA starts dropping down volumes of data that are considerably greater than the volumes of data than we are seeing today, and expect an organization like NIMA to start processing, and exploiting that data. That does not come close at all right now with the budget that NIMA has to do TPED.

So I think it is a combination of those two problems, in particular, that create the TPED problem, and then you add on top of that that we have spent a lot of money on collection, we have a lot of smart people in the Intelligence Community and the defense community that know how to build collection systems. I am not as confident that we have an equal number of people who know how to build processing and exploitation systems of the kind we are talking about.

Senator ALLARD. You may want to elaborate on that response. There was also, I think, a desire to see the geospatial function combined with the imagery intelligence. To what degree have these two functions, the merging of these two functions, taken place, and to what extent do you think NIMA programs, has actually brought this to reality?

Mr. MARINO. Does somebody else want to do this? I feel like I am doing all the talking. Why do you not go ahead and talk about that?

Senator ALLARD. Mr. Hineman.

Mr. HINEMAN. I have been involved with the NIMA and the formation of NIMA for a number of years from outside. I sat on the panel in 1992, and another one in—I chaired a government task force from private industry in 1995. It was clear in my mind that the day had come when we really needed to put the imagery and the geospatial folks together.

That is the basis of all of our, really all of our intelligence. Whatever the intelligence is, we can locate it on the map somewhere, on the globe, we can tie it and reference it in that way.

Has it come together yet like it should? No. Part of it is the culture's problem, and part of it is the TPED problem. There is an effort underway as we speak that General King has initiated, which is called the America's Cell, where he has put the imagery analyst and the geospatial analyst physically together to work the Americas' problems, Central and South America. I think the proximity of those individuals working together will bring about what some of us saw years ago. Time will tell, though.

Senator ALLARD. Yes?

Mr. O'CONNELL. I think I agree wholeheartedly with what Evan said. I guess I would add that in our Commission report, we described the vision of that merger of the two disciplines as being largely unfulfilled.

I would add, however, that in a number of cases, probably anecdotal at the level we saw them, we did see the development of some very innovative intelligence products by virtue of the successful merger of the two, and, again, as Evan has said, the extent to which we have people working together side-by-side, day-after-day, means that this is a problem that hopefully will correct itself over time, with the emphasis from the NIMA leadership.

Mr. MARINO. Yes, let me explain just a little bit, because you were not involved in all the details. One of the problems is a cultural problem. When NPIC, which was part of the CIA, came together with DMA, there was a category of work forces still called an imagery analyst. There was also a geospatial analyst.

Well, no imagery analyst wants to be a geospatial analyst, and no geospatial analyst, particularly—they all have their own beliefs that their job is the most important, and trying to take those two cultures, force them together to try to work together, so that they learn from each other and become one, has been a very difficult task for NIMA, and the real effort started a couple of years ago, General King started it.

But that is really the primary cultural issue that they are trying to work on right now at NIMA, and it is moving slowing, but I think eventually they will get—time will certainly fix this, and that is about the only thing you can say, is that you hope time does fix it.

Senator ALLARD. Senator Reed.

Senator REED. Thank you very much, Mr. Chairman.

Thank you, gentlemen, not only for your testimony, but for your work on the Commission.

Mr. Marino, you described a very challenging task of modernizing the TPED operations, and the training agency, and other agencies, for example, the Ballistic Missile Defense Office, has chosen a systems integrator, a subcontractor, to do those things for them. Have you thought about that concept in relation to NIMA?

Mr. MARINO. Do you mean a contractor to do the systems engineering?

Senator REED. They would come in and do some of the integration.

Mr. MARINO. Yes. I think that is right, but I think you have to have good contractors, with good systems engineering capabilities. Again, I am skeptical—well, this whole question of systems engineering capability, even in industry today, is, to me, a very worrisome aspect of big system development, but you still need good people in the government.

What makes the NRO work, and has made the NRO work, in my opinion, is that it had very good contractors, who had good systems engineering capability, but it had very good government people, who understood systems engineering, and understood how to direct those folks, and that is—very good government people is what is missing more than anything else.

Senator REED. Well, the subcommittee has responded to some of these concerns by increasing the number of Defense Intelligence senior executives service positions.

Mr. MARINO. Right.

Senator REED. I think that is the approach, but I think we all recognize that we are facing a situation where these systems engineers, and these computer specialists are in such high demand by industry, that even some of the most attractive options in the Federal Government, opportunities, are not being taken up, but despite that, we have to get on with the task, and I wonder if you have any——

Mr. MARINO. Yes. I mean we have—this is a question that is, all you have is ideas, and every time you come up with an idea, it seems like it does not work for one reason or another.

So let me start off by saying, the first thing we thought was, it makes sense that maybe we would go to the NRO and ask them to see whether they were interested in doing the systems engineering for the TPED system, and the first thing—the answer we got from the Director of NRO was that we do not have the resources to do it, we do not have the people to do it. We agree it needs to be done, but we do not have the people to do it.

So then we tried to construct a way—one of the other thoughts that underlines all this is that we believe NIMA, besides being an intelligence-producing agency, in the future, it is going to be one of the most important acquisition agencies in the U.S. Government, because getting on with the TPED problem, and trying to solve that problem is a big acquisition and systems engineering problem.

So we think that we need more systems acquisition expertise at the senior levels of NIMA, which I think is probably easier to do than to get the actual working people with the right kind of skills.

Then we concocted something called the EPO, which is a program office made up of people who would come in from industry, paid above government salaries, and even then it would be hard to attract them, and that program office and that TPED acquisition group would be given some of the procurement authority that the DCI has. We would also use the offices of the DCI to call on his relationships with industry to ask people at the major information systems and major contractors around the country to actually help fill this extraordinary program office, with the right kinds of people, pulling on their patriotic string and saying, "We would appreciate it if you would decide to donate one or two people today."

We tried to construct a program office within NIMA that was made up of outside people, who were being paid more than government salaries, but actually had the right kind of expertise.

The idea would be that if you had the right kind of people in place, you might be able to attract some more of the right kind of people, and through just osmosis, be able to pass off some of the skills and capability.

To help solve the senior-level management acquisition expertise, we suggested a technical advisory panel. The technical advisory panel could have a lifetime for long as it is necessary, but these would be people who have either retired out of the government, and they have big systems engineering acquisition experience, to be an advisor to the Director of NIMA, and be an overseer to do the work that is going on on the TPED program for the Director of NIMA. That was the best we could come up with.

Then with the Extraordinary Program Office recommendation, we immediately ran into problems with the Office of General Counsel, so it gets—it is hard, but something has to be done.

Senator REED. Thank you.

Mr. Hineman, you had a comment.

Mr. HINEMAN. I wanted to speak for a few minutes from a different aspect.

Senator REED. Sure.

Mr. HINEMAN. I think what maybe you were getting at was, how can we get enough of the quality people that we need into the government, given this day and age that we are in? General Weinstein spent many years in the government, and I spent nearly 34 myself. We did not get a lot of stock options, and did not make a lot of money doing that, but we loved every minute of it. The difference was that there was a challenge there.

The challenge in those days was the Soviet Union and all that it stood for, and there was a mountain to climb, and we had the opportunity to come up with initiatives.

I think in the past few years, we have tended to say, "Intelligence really is not all that important any more. The world is such at peace that"—it was never said, but that inference was coming across, and I think we need—not that we need to build a Soviet Union, but we need to build a mountain. We need to build a challenge so that the talented people will want to come and serve the nation.

Senator REED. Thank you very much, Mr. Hineman.

Thank you, Mr. Chairman.

Senator ALLARD. Senator Reed, are you going to have any more questions?

Senator REED. No. Go ahead and ask your questions, and then if I have any more, I will ask them.

Senator ALLARD. Thank you. I just want a clarification of the $350 million recommendation. Now, this is not a NIMA account. It is under the control of NIMA, am I correct in that?

Mr. MARINO. That is correct.

Senator ALLARD. This is under the Secretary of Defense.

Mr. MARINO. That is right. That is correct. Yes. I will explain—let me tell you what we had in mind, and what John White had in mind, and maybe we modified it a little bit.

The idea would be an account that would be set up somewhere under the Secretary of Defense, we did not specifically say where, where the services could draw down on those dollars, and buy imagery and commercial products, it does not have to be commercial imagery from satellites, but it could also be commercial products, to help them do what they needed imagery to do.

NIMA would serve two functions in this, from our perspective. One, they would serve as the organization that certified the supplier. They would go to a company, one of the commercial companies, Space Imaging, there is another one, Earth Watch Group, and they would certify that this is a legitimate supplier to the U.S. Government. We have looked at their practices, and we have looked at how they do their business, and at the product that they are selling. The product you asked for is the product that they are selling, and NIMA would be the quality control officer.

The second function that NIMA would have is that they would have the opportunity to take the same image that anybody else in the U.S. Government bought for their own purposes, and put it in their library, so the U.S. Government would not have to buy it twice. So we would then have within the NIMA library this image that maybe a general in Kosovo wanted to share with one of the coalition forces and that image would also end up in the NIMA library.

It would provide an opportunity or a product, and then the product provides an opportunity to jumpstart the use of commercial imagery in the intelligence and defense communities, and at the end of the day, it was actually John White's opinion that $350 million in the third year would look a lot greater—it would be a lot greater than that, because there would be such a demand for the imagery.

Whether that is true or not, I think only time could tell, but we believe that if you do not do it, you will never know.

Senator ALLARD. You have people other than the Defense Department that are requesting your services, the Environmental Protection Agency, Commerce, State. How feasible is it to ask them to pay for the services that they are requesting? As long as it comes free, then there is no end of demand, but if they see a cost to their budget, would they then go ahead and begin to prioritize their requests, and would this help take care of the TPED problem?

Mr. MARINO. I am not sure, but let me answer it differently. We looked at imagery as a commodity, not unlike buying paperclips. I do not mean to trivialize it, but it can be looked at that way, so if you need a box of paperclips, you would draw down on whatever budget you have for paperclips, and you would buy a box of paperclips.

There is no such facility to do that within the Defense Department. We had two hopes for that. One, that it would end up jumpstarting the commercial industry, and would also look—we would figure out for sure whether commercial imagery can pick up some of the burden that FIA is supposed to provide.

If it is, you then have the opportunity of taking some of the commodity stuff out of the Intelligence Community, and the opportunity to push the NRO to a more higher end to do more exquisite kinds of things, rather than commodity kinds of things.

Whether the Department of Commerce has within their budget to do it, I am not sure—I do not have the answer for you about how we would get NOAA to buy commercial imagery. I think they would just have to buy it, unless the U.S. Government set up a fund under the President of the United States where everybody could draw down on it, which seems, I think, to all of us, a little impractical.

Senator ALLARD. I guess another way of structuring this is to use the airlift—somebody use the airlift model, and what is most appropriate when you—based on circumstances, is it a 747, or is it a C–17, whatever it is, depending on the circumstances, and it seems to me that maybe NIMA should decide on how, after the customer decides on what he needs.

Mr. MARINO. Oh. Yes.

Senator ALLARD. Maybe that needs to be thought about, and how do you apply that.

General WEINSTEIN. May I add just one small point?

Senator ALLARD. Yes.

General WEINSTEIN. If someone thinks that the idea of the fund of $350 million is a good idea to encourage the use of commercial industry, so the Defense Department gets in the habit of it, and that would be wonderful, but if they would take the $350 million and say, "Well, we will take that away from NIMA," that will just—you already have an organization that is grossly underfunded, and so another $350 million hit of the other things it has to do would be disastrous.

Mr. MARINO. We all agree with that. We think NIMA—by virtue of the fact that it has had some performance problems, and those performance problems are as much a result as this forcing together of two organizations and trying to get up on your feet, they ought not to be penalized by continuing to cut their budget, because for sure, there is a question of whether they—the risk is high giving them the money to do these systems, and to do the various things.

There is no risk if they do not have the money. It is just not going to happen. It seems to me that it is a risk worth taking.

Senator ALLARD. Mr. O'Connell.

Mr. O'CONNELL. One of the problems with commercial imagery discussion is that we see it going on day-after-day, because it is still largely about the government buying images, and, in fact, there is utility for the government, for NIMA, in buying images.

However, there is a much wider set of products and services that can probably be purchased out of industry, thought through creatively, that support the intelligence and the national security missions. We are not seeing a lot of that discussion taking place.

Images have a role in the product slate that the Intelligence Community buys, but it is only one piece of the picture. There is a whole other set of things that we have not even thought about yet. How to use data base accesses, et cetera, that might be very useful for NIMA to entertain with the commercial industry.

Senator ALLARD. OK. We have run out of questions and members. I want to just say in closing that we are going to make your presentations a part of the record, and I ask for unanimous consent to make your full statements a part of the record.

We will also hold the record open for 2 days for questions for the record. If you get any questions, we would appreciate if you would give them back in an expedited manner.

[The information referred to follows:]

# The Information Edge: Imagery Intelligence and Geospatial Information in an Evolving National Security Environment

## Review of the Independent Commission

Senate Armed Services Committee

3 April 2001

## Commission Origins

- Mandated in the Appropriations Conference Committee Classified Annex to the FY2000 DoD Appropriations Bill
  - Appointments delegated from SecDef and DCI to ASD/C3I and DDCI/CM
- Directives on Commission Membership
  - Drawn from within and outside of government
  - Shall include expertise in
    - Large system development and acquisition
    - Information technology
    - Imagery technology
    - Telecommunications technology
    - Organizational development
  - Shall include at least one member from the commercial imagery/GIS industry and one member from an independent audit organization (e.g., GAO)

# Commission Task

- A comprehensive review of NIMA's present organizational and management structures, current technology development and acquisition plans, business practices, and operational support services provided to DoD and the Intelligence Community.

# Commission Membership

- Peter Marino, Chairman
- Nancy Bone
- Jack Dangermond
- Evan Hineman
- Jim Hirsch
- Robert King
- C. Lawrence Meador
- Keith Rhodes
- Tom Weinstein
- Kevin O'Connell, Executive Secretary

# Broad Findings

- **NIMA is an essential component of US national security, a key to information dominance. Despite some shortcomings it is a vital, if under-appreciated, organization staffed with talented individuals and led by dedicated officers.**
- **Despite its acknowledged criticality to information dominance, NIMA is under-resourced overall, not only for TPED acquisition (USIGS modernization), but also for commercial imagery procurement, R&D, and training for its officers and for the larger imagery and geospatial community.**
- **D/NIMA does not fully assert his role as functional imagery manager, has too little say over end-to-end architecture (including the "last tactical mile") and too little leverage over all intelligence and defense imagery-related investment**

# "National Versus Tactical"

Issue

Is NIMA's customer support overly biased toward military customers?

Findings

This description is unhelpful

Time to turn down the heat

This problem reflects broader trends in intelligence that need attention

-- resource shortages, short term versus long term focus

Component problems contribute to perceptions

-- lack of collection feedback, poor communication and collaboration, NIMA's mediator role, scarcity of experienced imagery analysts, and proximity of IA's to all source customers

# "National Versus Tactical"

Commission Recommendations

Maintain DCI tasking authority in peacetime, to ensure balance between competing security interests; DCI should provide mechanism for resolution

Endorse D/NIMA shift of 300 positions from cartography to imagery analysis, emphasis on long-term analysis

Improve NIMA facilitation of tasking process, including more communications with customers about cost and opportunity cost of collection

Improve communications between NIMA and imagery customers, in order to optimize collection

# TPED

Definition

TPED stands for tasking, processing, exploitation, and dissemination

Issues

What is TPED? Is NIMA equipped to acquire TPED? Is there sufficient funding for TPED?

Findings

TPED is the set of systems and capabilities that task and deliver imagery and geospatial information to an analyst, as well as the exploitation tools to use it

# TPED

Findings

Intelligence Community remains collection centric

There is a justifiable lack of confidence in NIMA's ability to acquire TPED

-- lack of a baseline architecture

-- lack of system acquisition skills

-- need for new approaches

Cost of TPED is significantly underestimated

TPED plan must incorporate satellite, airborne, commercial, and other data sources

# TPED

Commission Recommendations

ASD(C3I) and DDCI/CM should work with NIMA to seek the sources and means -- dollars, management, and skilled personnel -- to make NIMA's mission whole and its infrastructure functional

DCI and SECDEF, with full support of the Congress, should form an "Extraordinary Program Office to assure the prompt and efficient acquisition of TPED

SECDEF shall direct ASD(C3I) and C/JCS to assist D/NIMA and D/NRO with a plan to integrate airborne and commercial data into TPED

# TPED

Commission Recommendations

Improve NIMA R&D, including CTO position

D/NIMA needs to get out in front of any FIA upgrade, in order to understand TPED implications

D/NIMA should establish a technical advisory board

## NIMA's Interactions with the Commercial World

Issue

How well is NIMA doing with its commercial interactions? How might NIMA take more advantage of the commercial world?

Findings -- Commercial Imagery

U.S. commercial remote sensing strategy has been poorly implemented

FIA-era collection relies heavily on commercial imagery data for peacetime and wartime scenarios

NRO/NIMA commercial imagery strategy commitments are unfulfilled

## NIMA's Interactions with the Commercial World

Findings -- Outsourcing

NIMA needs to outsource legacy processes and products

Findings -- Commercial Technology

NIMA must develop new practices for rapid insertion of commercial technology into its information architecture

NIMA must push analytic tools down to the user, because of the chaotic nature of intelligence business

Findings -- Commercial Practices

NIMA remains an unpredictable business partner

## NIMA's Interactions with the Commercial World

Commission Recommendations

D/NIMA in concert with D/NRO, should develop a new commercial imagery strategy, consistent with current market conditions

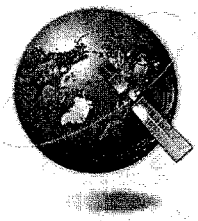
The Office of the Secretary of Defense should establish a fund against which defense elements wishing to make use of commercial imagery can charge their purchases

D/NIMA should commission a study to determine the maximum extent to which outsourcing could be extended, including infrastructure, legacy MC&G products, and science-based imagery analysis

Senator ALLARD. I want to thank you all personally for taking the time to serve on the Commission and for taking the time to testify before this subcommittee. We thank you for your time and for your expertise. Thank you.

Now we will adjourn the subcommittee.

[The Report of the National Commission for the Review of the National Reconnaissance Office and the Report of the Independent Commission on the National Imagery and Mapping Agency follow:]



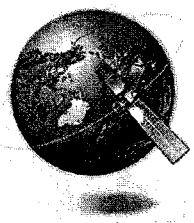
# REPORT OF THE NATIONAL COMMISSION FOR THE REVIEW OF THE NATIONAL RECONNAISSANCE OFFICE

# THE NRO AT THE CROSSROADS

*"No one wants another Pearl Harbor. This means that we must have knowledge of military forces and preparations around the world."*

*President Dwight D. Eisenhower*

NOVEMBER 1, 2000



# FOREWORD

The National Commission for the Review of the National Reconnaissance Office (NRO) is one of several Commissions that have been chartered in recent years to review the various intelligence and security institutions charged with maintaining the national security of the United States. The Commission's review is significant because the NRO provides unique intelligence capabilities that are vital to maintaining our national security.

This formerly secret spy agency develops, acquires and operates the most sophisticated satellite reconnaissance systems in the world. These satellites play a crucial role in protecting U.S. national security interests at home and around the world.

However, since the end of the Cold War, NRO programs previously viewed as vital to the nation's survival have become immersed in much of the normal governmental process. As a result, they no longer enjoy the personal involvement of the President or his senior advisors.

NRO program budgets, along with other intelligence program budgets, have been constrained and modernization has been delayed for several years. This circumstance has taken its toll on national reconnaissance capabilities. Moreover, this trend comes at a time when the plethora of threats facing the United States has never been more complex. Additionally, the proliferation of commercial imaging technologies and other public sources of information are providing our adversaries with unprecedented insight within our national borders, as well as into our overseas activities.

Equally problematic, widespread knowledge of the NRO's existence and public speculation on how NRO satellites are used has aided terrorists and other potential adversaries in developing techniques of denial and deception to thwart U.S. intelligence efforts. Similarly, other technologies, such as fiber optic communications, render certain NRO capabilities obsolete. Add to this the fact that the number of continuing U.S. military commitments and other U.S. interests around the globe that require continuing support is stressing the capacity of U.S. reconnaissance assets, and the result is a prescription for a potentially significant intelligence failure.

The Commission believes that these circumstances and the risks they pose to the security of the United States are so important that the results of its review of the NRO should be set forth to the maximum extent possible in this unclassified Report. In it, the Commission has underscored the need for leadership, direction and participation by the President in setting priorities and ensuring that adequate resources are provided to enable the NRO to develop innovative space-based or space-related solutions to meet the most difficult intelligence problems facing the United States.

Equally important is the need for a close and sustained working relationship between the Secretary of Defense and the Director of Central Intelligence who share in the management and oversight of the NRO. These individuals are key to ensuring that the NRO maintains technological superiority, despite the inevitable pressures to continue maintaining current capabilities at the expense of essential modernization.

The Commission believes it is vital that this review of the NRO and the resulting recommendations be considered as part of a comprehensive and overarching national security policy and strategy. This will help ensure that the proper array of intelligence capabilities is available for the continued survival and security of the United States in the 21st Century.

J. Robert Kerrey
Co-Chairman

Porter J. Goss
Co-Chairman

Wayne Allard

Anthony C. Beilenson

Larry D. Cox

Joan A. Dempsey

Norman D. Dicks

Martin C. Faga

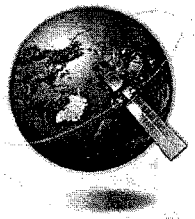
Patrick M. Hughes

Eli S. Jacobs

William Schneider, Jr.

# ORGANIZATION OF THE REPORT

The Executive Summary of the Report (pages 1-19) is intended to be a "stand-alone" document that summarizes only the most critical of the Commission's findings and recommendations. Thus, the Executive Summary differs somewhat in organization and structure from the main body of the Report (pages 21-76) and does not contain all the Commission recommendations, which are listed separately in Appendix A (page 77). Detailed historical and special subject Appendixes are also included at the end of the Report (pages 83-183).



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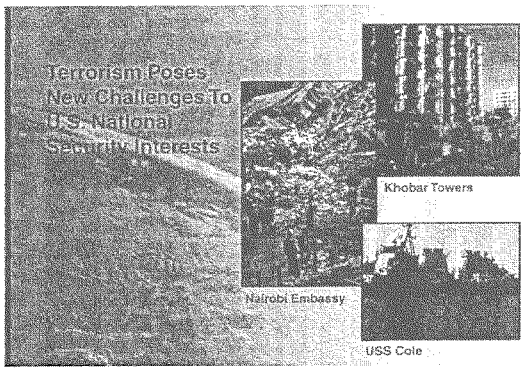
# EXECUTIVE SUMMARY

## Changes in The National Security Environment

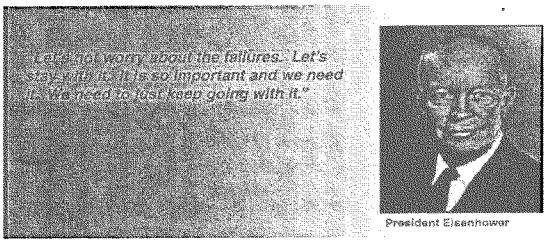
The Commission found that NRO reconnaissance satellites have had a crucially important role during the past four decades in providing American Presidents a decisive advantage in preserving the national security interests of the United States. These satellites, which can penetrate hostile and denied areas with no risk to life and rapidly deliver uniquely valuable information, have allowed a succession of Presidents to make informed decisions based on critical intelligence and to respond appropriately to major crises, threats and challenges to U.S. interests. Without them, America's history and the world's could have been dramatically different.

For 40 years, the NRO has pioneered technical marvels in support of space reconnaissance. Quite literally, the NRO's achievements in space have provided the nation its "eyes and ears" for: monitoring the proliferation of weapons of mass destruction and compliance with arms control agreements; tracking international terrorists, narcotics traffickers and others who threaten American lives and interests around the world; providing operational intelligence and situational awareness to our armed forces in situations ranging from combat to peacekeeping; and helping to anticipate and cope with disasters, ranging from wildfires in the American West to volcanic eruptions in the Pacific to humanitarian crises in the Balkans.




In many ways, the risks to the security of the United States from potentially catastrophic acts of terrorism and weapons of mass destruction and mass disruption are more complex today than those the United States confronted during the Cold War. The number of extended U.S. military commitments and other U.S. interests around the globe that require continuing support is stressing the capacity of NRO reconnaissance systems and the Intelligence Community to detect critical indications and warnings of potentially threatening events. Further, the NRO does more than just build satellites. Integrating all-source intelligence requires it to produce new technologies. Together, these and other evolving conditions place an enormous premium on maintaining a strong space reconnaissance capability.

**Great technical advances do not come without trial...and some errors**




NRO capabilities have been available for the past 40 years because President Dwight Eisenhower and his successors clearly understood the

significance of space reconnaissance to our national security. They had the tenacity and determination to endure the many risks and failures inherent in space technology, and they personally directed and sustained the investment needed for its development. The United States is far more secure today because of this prior investment, commitment and level of personal attention.

However, the clarity of mission and sense of urgency that led past Presidents and Congresses to invest in the future of space reconnaissance dissipated with the Cold War's end. The disappearance of a single large threat has provided a false sense of security, diverting our attention from national security issues and, for the NRO, resulting in under-investment. Unfortunately, this false sense of security has been accompanied by a particularly ill-timed lack of policy direction to the NRO from senior officials. This comes at a time when the array of threats facing the United States has never been more complex and the demands on the NRO from new customers have never been more intense.

Users of the intelligence provided by the NRO's satellites have long competed for priority. But now, the number of these customers has expanded dramatically. Advances in military technology have led military customers to develop a voracious appetite for NRO data. At the same time, non-military customers increasingly demand more information from the NRO regarding a broad array of intelligence targets. Also, dynamic changes throughout the Intelligence Community and enormous growth in information technology are significantly affecting the NRO. In the absence of additional resources, the NRO is being stretched thin trying to meet all its customers' essential requirements.

We believe the American people may assume that space-based intelligence collection matters less today than it did during the

Cold War at a time when, paradoxically, the demand for the NRO's data has never been greater.

This Report stresses the need for decisive leadership at the highest levels of the U.S. Government in developing and executing a comprehensive and overarching national security policy and strategy that sets the direction and priorities for the NRO. **Ensuring that the United States does not lose its technological "eyes and ears" will require the personal attention and direction of the President, the Secretary of Defense and the Director of Central Intelligence (DCI).**

There has been and will continue to be understandably heavy pressure to maintain current, aging capabilities rather than to bear the expense of riskier modernization and development of advanced technologies. Without bold and sustained leadership, the United States could find itself "deaf and blind" and increasingly vulnerable to any of the potentially devastating threats it may face in the next ten to twenty years.

## Overall Finding and Conclusion

**The Commission concludes that the National Reconnaissance Office demands the personal attention of the President of the United States, the Secretary of Defense and the Director of Central Intelligence. It must remain a strong, separate activity, with a focus on innovation, within the Intelligence Community and the Department of Defense. Failure to understand and support the indispensable nature of the NRO as the source of innovative new space-based intelligence collection systems will result in significant intelligence failures. These failures will have a direct influence on strategic choices facing the nation and will strongly affect the ability of U.S. military commanders to win decisively on the battlefield.**

# Summary of the Commission's Key Findings and Recommendations

## Changing NRO Responsibilities

Throughout its history, the NRO has met the challenge of providing innovative, space-based reconnaissance solutions to difficult intelligence problems. Since the earliest days of the Corona spy satellites, when the NRO developed the first space-based photographic capability, the NRO has remained on the leading edge of space technology.

The NRO's success at innovation has been made possible by:

- involvement by the President and the joint Secretary of Defense-DCI responsibility for management of the NRO;
- its status, under the NRO Director, as the **only** Government office responsible for developing space reconnaissance systems;
- staffing by Department of Defense (DoD) and Central Intelligence Agency (CIA) personnel;
- adequate funding with sensible reserves;
- a high degree of secrecy;
- technological depth focused on developing space reconnaissance solutions to difficult intelligence problems; and
- experienced program managers empowered to make decisions and requiring minimal oversight.

It is important that the NRO remain focused on its primary space-based reconnaissance mission. It is equally important that both the NRO's special talents and the institutional foundation that has facilitated its success for four decades be carefully preserved.

The NRO has often approached its mission from an "end-to-end" perspective. The NRO did more than build satellites to collect information. It also built capabilities to task the satellites, process the data collected and disseminate the information to its primary users. By taking this comprehensive approach, the NRO was able to develop high-performance satellite systems that better served its customers' needs.

However, the structure of the Intelligence Community has changed since the NRO's earliest days. New organizations exist and many intelligence functions are now shared. Tasking, processing, exploitation, and dissemination (TPED) functions are dispersed throughout the Intelligence Community. In this changed environment, some officials are concerned that the NRO is duplicating efforts in areas for which other agencies now have primary responsibility.

The National Imagery and Mapping Agency, the National Security Agency, and the Central MASINT [measurement and signature intelligence] Organization bear primary responsibility for managing the tasking and dissemination of information collected by NRO satellites, and processing of intelligence data is shared among these same organizations. At the same time, the NRO is responsible for ensuring its satellites operate efficiently and effectively.

In developing TPED processes in connection with its own systems, the NRO often has developed innovative solutions to difficult problems in these areas. To encourage development of creative solutions in the future, the Commission believes it important that the delineation of responsibilities for TPED be carefully and regularly evaluated by senior officials in order to avoid duplication and enhance Intelligence Community efficiency and effectiveness. (See page 26 for further discussion.)

**The Secretary of Defense and Director of Central Intelligence must direct that the NRO mission be updated and focused as a first priority on the development, acquisition and operation of highly advanced technology for space reconnaissance systems and supporting space-related intelligence activities, in accordance with current law.**

**The Secretary of Defense and Director of Central Intelligence should determine the proper roles for the NRO, National Security Agency, National Imagery and Mapping Agency, and Central MASINT Organization in tasking, processing, exploitation, and dissemination activities.**

## NRO Technological Innovation

Over time, the NRO has gained a well-deserved reputation as the preeminent research, development and acquisition (RD&A) organization in the Intelligence Community and DoD. As a result of changes in recent years, however, some claim the NRO has lost its streamlined acquisition and integration capability and its ability to develop and apply new technologies rapidly.

The Commission believes NRO leadership is doing its best in emphasizing RD&A; in accepting new ideas, concepts and base technologies from any source; and in applying "leap ahead" and "revolutionary" technologies to its work. The NRO's focus is, as it should be, on technologies that will enhance, improve, or fundamentally change the way in which the United States engages in space-based reconnaissance.

The NRO's development and application of new technologies has sometimes been limited by a resource-constrained budget process. The budget process is not well suited to making judgments about the value of developing new technology. In these circumstances, recommendations from the Intelligence Community,

Office of Management and Budget, or other budget staffs regarding whether or not to provide resources for an NRO program should not be made without the benefit of clear guidance from senior officials based upon the value of the technology being developed in the NRO program. Decision-makers must ensure that they are provided personally with the technical understanding needed to assure that the decisions they make with regard to NRO technology innovation efforts are informed decisions. (See page 32 for further discussion.)

**The President of the United States, the Secretary of Defense and the Director of Central Intelligence must pay close attention to the level of funding and support for the NRO Director's research, development and acquisition effort.**

**The Secretary of Defense and Director of Central Intelligence should ensure common understanding of the NRO's current and future capabilities and the application of its technology to satisfy the needs of its mission partners and customers.**

## Office of Space Reconnaissance

From its beginning, NRO success has been based upon several special attributes. Among these have been: the personal attention of the President; a close partnership between the Secretary of Defense and the Director of Central Intelligence; a single Director and organization with technological expertise focused on space reconnaissance on behalf of the DoD and CIA; experienced CIA and military personnel and program managers; and a strong cloak of secrecy surrounding its activities.

Over time, these attributes have eroded. The Commission observes that one of the most important changes is that implementation of the Secretary of Defense-DCI partnership has been

delegated to lower-level officials. Also, the NRO Director is caught in the middle of an intense debate regarding whether strategic or tactical intelligence requirements should have higher priority in NRO satellite reconnaissance programs. The personnel practices of other organizations are discouraging NRO personnel from seeking repetitive assignments within the NRO. The NRO has become a publicly acknowledged organization that openly announces many of its new program initiatives.

These changes are a direct response to the circumstances described earlier. While many of the changes have been warranted, they have had a limiting effect on the NRO's ability to attack the most difficult intelligence problems quickly with the most advanced space reconnaissance technology. Perhaps more importantly, they have weakened the foundation of congressional and presidential support upon which the NRO's success has been built.

The Commission believes structural change is needed. A new office should be established that, by recapturing and operating under the NRO's original attributes, will respond more effectively to technological challenges in space reconnaissance. The Commission suggests this office be called the Office of Space Reconnaissance.

This would require that the Secretary of Defense grant this Office special exemptions from standard DoD acquisition regulations. It would rely heavily upon the DCI's special statutory authorities for procurement. It would be under the direction of the NRO Director, but would operate in secure facilities separated from NRO activities. It would create and defend a separate budget element within the National Foreign Intelligence Program and have its own security compartment. It would have a small CIA and military staff and senior and experienced program managers, and would also rely heavily upon the creativity of the contractor community for its work. It would respond, through a special Executive

Committee, to direction from the President, the Secretary of Defense and the DCI. The new Office would attack the most difficult intelligence problems by providing advanced technology that will lead to frequent, assured, global access to protect U.S. national security interests.

The Commission emphasizes that creation of the Office of Space Reconnaissance does not diminish the fundamental importance of the NRO and its mission. Under this approach, the NRO would continue to serve the broad and growing strategic and tactical customer base. It would also continue to evaluate and apply leading edge technology to meet the needs of those customers, and to confront and overcome the intelligence challenges facing the Intelligence Community and DoD. (See page 39 for further discussion.)

**The Secretary of Defense and the Director of Central Intelligence should establish a new Office of Space Reconnaissance under the direction of the Director of the NRO. The Office should have special acquisition authorities, be staffed by experienced military and CIA personnel, have a budget separate from other agencies and activities within the National Foreign Intelligence Program, be protected by a special security compartment, and operate under the personal direction of the President, Secretary of Defense and Director of Central Intelligence.**

## The Secretary of Defense-Director of Central Intelligence Relationship

The NRO serves both the Secretary of Defense and the DCI. In the NRO's early days, several agreements established the relationship between the Secretary of Defense and the DCI. Today, the NRO is operating under agreements between these two officials, all of which are at least thirty-five years old.

Space has proven to be the most effective means for gaining frequent, assured access to denied areas on a global basis. The NRO's history is filled with successes in answering intelligence questions asked by military and civilian leaders who faced difficult national security challenges.

The Commission evaluated the desirability of recommending the creation of an "NRO statute." Such a law could firmly secure the NRO's position in the national security community. After debate, the Commission concluded that congressional action in this regard could make the situation worse, rather than better. It believes senior level Executive Branch attention should be sufficient at this time.

Therefore, in order to achieve the most cost-effective means for gaining global access to denied areas, the President, Secretary of Defense and Director of Central Intelligence must work closely together to direct the NRO's efforts. (See page 44 for further discussion.)

**The President must take direct responsibility to ensure that the Secretary of Defense and Director of Central Intelligence relationship regarding the management of the NRO is functioning effectively.**

## Balanced Response to Customer Demands

Developments in information technology have both benefited and challenged the NRO. Because of these developments, information the NRO collects is more readily available to tactical military commanders and plays a significant role in gaining information dominance. As a result, military theater and tactical commanders increasingly expect and demand NRO support.

The NRO's global presence also continues to provide senior strategic decision-makers with information essential to their

understanding of the international environment. As has been the case since its earliest days, the NRO's satellites acquire information other intelligence sources are unable to provide. Its satellites furnish a unilateral, low profile, zero risk, and secure means of collecting highly sensitive intelligence. They support diplomacy, prevent war, aid the war on drugs, monitor the development of weapons of mass destruction, and help thwart terrorist activities.

Customer demands, however, exceed the NRO's capabilities. As is the case with all U.S. national security activities today, the NRO's budget is constrained and it competes for resources with other intelligence agencies that are also facing new challenges created by the changing threat and the explosion in information technology.

Because it responds to both the Secretary of Defense and the DCI, the NRO frequently is caught between the competing requirements of both DoD and non-DoD customers, all of whom expect to be satisfied by NRO systems. With its systems over-taxed and unable to answer all demands, yet attempting to be "all things to all agencies," the NRO often bears the brunt of criticism from all sides.

Because of these pressures, the NRO is a strong and persistent advocate for greater resources in an era of limited Intelligence Community budgets. However, the Commission's recommendations are focused on balancing competing needs because it is not possible simply to "buy" a way out of the problem. (See page 49 for further discussion.)

**The Secretary of Defense and the Director of Central Intelligence must work closely together to ensure that proper attention is focused on achieving the appropriate balance between strategic and tactical requirements for NRO systems, present and future.**

## Defense Space Reconnaissance Program

In response to the long-standing need for the NRO to develop space reconnaissance assets that respond to both strategic and tactical requirements, the Defense Support Project Office was established in 1981. The NRO Director also served as the Director of that Office.

The Office was responsible for the annual development of the Defense Reconnaissance Support Program (DRSP) contained in the DoD Tactical Intelligence and Related Activities (TIARA) Program. DRSP funds generally were used to pay for NRO activities that were necessary to satisfy military-unique space reconnaissance requirements.

In 1994, DRSP funding was substantially reduced. Responsibility for satellite acquisition and infrastructure costs was shifted to the National Reconnaissance Program. The name of the DRSP was changed to the Defense Space Reconnaissance Program (DSRP), which became focused on educating military customers on how to use NRO systems more effectively. These changes ended DoD's direct funding of NRO reconnaissance systems and took place even as DoD's appetite for NRO information was growing substantially in response to the military's experiences in the Gulf War.

The debate over which customers should have higher priority for NRO space reconnaissance capabilities is partly the result of the need to allocate scarce funds. Experience since 1994 suggests that certain programs to support tactical military requirements have had increasing difficulty competing for funds within the National Reconnaissance Program (NRP). This is because NRP spending to address those requirements consumes resources appropriated to the National Foreign Intelligence Program (NFIP). Some believe those requirements should be supported by

intelligence funding taken from the DoD budget. Thus, the debate often is not about whether the NRO should undertake an activity, but rather how the NRO will fund it.

The Commission believes it is time to re-establish funds within the DoD budget that will pay for the acquisition of systems and sensors designed to support tactical commanders. If certain NRO acquisition decisions were made part of a DSRP budget process in this way, the military's Unified Commands would be directly involved in setting priorities for future space reconnaissance systems. Further, budget pressures on the NFIP would be reduced by such direct DoD funding for NRO systems. (See page 55 for further discussion.)

**The Secretary of Defense, in consultation with the Director of Central Intelligence, should re-establish the Defense Space Reconnaissance Program as a means of funding tactical military requirements for NRO systems and architectures.**

## Increased Resource and Budgetary Flexibility

Budget constraints affect the entire National Foreign Intelligence Program (NFIP). As each Intelligence Community activity strives to meet new challenges, it competes with other NFIP activities that have strong claims for resources. The dynamic budgetary environment and the diffuse national security threats require flexible measures for shifting resources to meet rapidly changing priorities.

The Director of Central Intelligence is responsible, in consultation with the Secretary of Defense, for the creation of the NFIP. This clear responsibility, however, is not matched by a similar responsibility for actual expenditure of the funds after they have been authorized and appropriated to the NFIP by Congress. Under current law, the Director may not shift such funds between

intelligence activities if the affected Secretary or department head objects.

The Commission's principal concern is the potential limit that this provision of current law places on the DCI's ability to shift resources to match quickly changing priorities in a dynamic intelligence environment. While the Commission recognizes this issue extends beyond the NRO, it believes it is of such significance for the NRO that a recommendation to remedy the situation is warranted. (See page 59 for further discussion.)

**The Director of Central Intelligence should be granted greater latitude to redirect funds among intelligence collection activities and agencies in order to respond most effectively to the specific types of issues that arise in NRO programs.**

## NRO Technical Expertise

The NRO's historic success is directly attributable to the high quality and creativity of its DoD, CIA and contractor workforce. Until the recent past, many military and civilian Government personnel served the majority of their careers as part of the NRO. Some never returned to their parent organizations for any appreciable length of time. This allowed a highly skilled cadre of personnel to advance within the NRO structure, gaining relevant experience in various positions of greater responsibility as they rose in rank.

New personnel assignment practices adopted by other organizations, such as the Air Force, have had the effect of limiting the tenure of personnel assignments to the NRO. There is a resulting concern that the NRO could lose its ability to sustain the cadre of highly-skilled and experienced personnel it needs to guarantee mission success because rotational assignments back to their parent organizations appear to be a requirement for career

advancement. In some cases, this cadre of personnel is prevented from obtaining equivalent broad space-related experience during these rotational assignments. While it is understandable that a parent organization may want to exploit the special skills its personnel develop in the NRO, the cost to NRO space reconnaissance programs may be greater than the value of broader experience to these other organizations.

The Commission believes there is a compelling need for a separate NRO career path and assignment policy that provides an opportunity for selected highly trained engineers, acquisition professionals and operations specialists to be assigned to the NRO on a long-term basis and progress through a broad range of NRO positions. The technical complexity of NRO systems is unique, and it requires the continuity of a dedicated cadre. The Commission believes the high quality and creativity of the NRO's military, CIA and contractor workforce must be sustained. (See page 60 for further discussion.)

**The Secretary of Defense and the Director of Central Intelligence should jointly establish NRO career paths to ensure that a highly skilled and experienced NRO workforce is continued and sustained.**

## Increased Launch Program Risks

The U.S. Government's national security space program is proceeding along several parallel paths. At the same time the NRO is embarking upon new satellite acquisition programs, the Air Force is transitioning its launch program to the Evolved Expendable Launch Vehicle (EELV) family of space launch vehicles. The NRO relies upon the Air Force to provide its launch capability. Thus, all the new NRO satellites are to be launched on the new EELV.

Historically, spacecraft and launch vehicle development programs have failed to meet original estimated delivery dates. In addition, the spacecraft and launch vehicles that initially emerge from new developmental programs carry a significantly increased risk of unforeseen difficulties. In the past, the effects of delays and launch failures could be mitigated because robust satellite capabilities were on orbit or sufficient launch vehicles were available as a back-up. Today, the fragility of the satellite and launch vehicle architectures offers no margin for error.

The Commission is alarmed that there appears to be no comprehensive strategy to address the increased risks presented by simultaneously developing new reconnaissance satellites and launch vehicles. This contributes to an already uncertain situation where new satellites will be launched on new boosters. (See page 63 for further discussion.)

**The NRO Director, with the support of the Air Force Materiel Command and Space and Missile Systems Center, should develop a contingency plan for each NRO program or set of programs. These plans should describe risks, contingency options and failure mitigation plans to minimize satellite system problems that might result from satellite or launch vehicle failures.**

## Commercial Satellite Imagery

Rapid technological developments in the commercial space industry are yielding capabilities that could usefully supplement U.S. Government-developed space reconnaissance systems. Although a National Space Policy exists that promotes the use of the products and services of the U.S. commercial space industry, the Commission did not find any executable plan, budget, or strategy that promotes the use of commercial satellite imagery.

The Commission supports Government purchases of one meter and one-half meter resolution commercial imagery, which can meet a large percentage of U.S. Government imagery requirements. The Commission believes there is a need for an overall assessment—independent of the NRO—of the utility of commercial technologies to supplement traditional NRO missions.

NRO imagery is provided to Government users "free of charge," while in many cases those same users have to use current funds to pay for commercial imagery. It is hardly surprising, therefore, that they find commercial imagery less attractive even as their demand constantly increases for the "free" NRO imagery. If commercial imagery is to achieve its potential to reduce the demands on NRO systems, decisions regarding the use of commercial imagery must be made on an even footing with decisions about the use of NRO-provided imagery.

The Presidential Decision Directive (PDD-23) that establishes U.S. policy regarding exports of remote sensing technology and data may be inhibiting effective U.S. responses to proliferation of such technology internationally. The Commission urges the next Administration to re-examine this Directive in light of recent experience. (See page 67 for further discussion.)

**A clear national strategy that takes full advantage of the capabilities of the U.S. commercial satellite imagery industry must be developed by the President, Secretary of Defense and Director of Central Intelligence.**

**The strategy must contain a realistic execution plan—with timelines, a commitment of the necessary resources and sound estimates of future funding levels.**

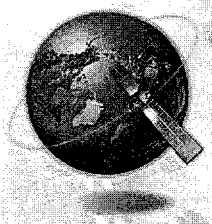
## NRO Airborne Reconnaissance Responsibilities

Until the early 1990's, the NRO also developed high altitude airborne reconnaissance systems, such as the SR-71 aircraft. In fact, a 1964 DoD Directive that remains in effect assigns responsibility for strategic airborne reconnaissance to the NRO.

Too often, space reconnaissance and strategic airborne reconnaissance are viewed as mutually exclusive capabilities. In fact, they are quite complementary and contribute unique support to a tiered concept of intelligence collection.

To achieve and maintain a proper balance between space-based and airborne reconnaissance, the Commission believes the NRO needs to restore its interest in airborne platforms and participate in engineering studies to select the proper platform for the required mission. (See page 75 for further discussion.)

**The NRO should participate jointly with other agencies and departments in strategic airborne reconnaissance development. Specifically, the NRO should supply system engineering capabilities and transfer space system technologies to airborne applications.**



# THE EVOLVING ROLE OF THE NRO

## The NRO Mission

The National Reconnaissance Office (NRO) develops, acquires, and operates our nation's most sensitive space reconnaissance satellite systems. These systems collect imagery intelligence (IMINT), signals intelligence (SIGINT) and measurement and signature intelligence (MASINT) of great value to the U.S. Government.

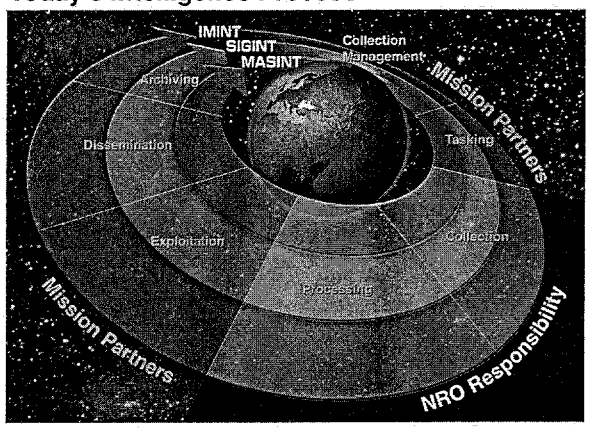
***National Reconnaissance Office (NRO) satellite systems collect raw data that are processed into a usable product by the NRO and provided to one of its mission partners for exploitation, analysis and dissemination of the final intelligence product to the customers that originally requested the information.***

Until 1992, the existence of the NRO was classified and even its name was not officially acknowledged by the government. Access to the data collected by its satellites was confined to a limited set of customers within highly classified intelligence channels. Today, the existence of the NRO is openly acknowledged and several aspects of its activities have been declassified. Additionally, the data collected by NRO satellites are now available to a wide variety of users in many U.S. Government agencies.

The NRO collects data via its satellites in response to requirements that are established by its customers—the end users of its products. Those requirements are screened through Intelligence Community processes that adjudicate competing requirements and set the priorities for collection. The prioritized requirements are then passed to the NRO for collection by its satellite systems.

NRO satellites collect raw data that are processed by the NRO and then provided to one of its mission partners: the National Security Agency (NSA) for SIGINT, the National Imagery and Mapping Agency (NIMA) for IMINT, or to the Central MASINT Organization (CMO) for MASINT. These entities are responsible for exploitation, analysis and dissemination of the final intelligence product to the customers that originally requested the information. (See graphic "Today's Intelligence Process," which highlights the responsibilities of the NRO in relation to its mission partners.)

**Today's Intelligence Process**




## Organizational Change

During its early years, the NRO was primarily involved in developing first-of-a-kind satellite systems for a limited number of strategic intelligence and military customers, and for the most part focused against a single intelligence target—the Soviet Union and the Warsaw Pact. At the outset, the NRO was small and agile. It also had the flexibility and authority to make rapid

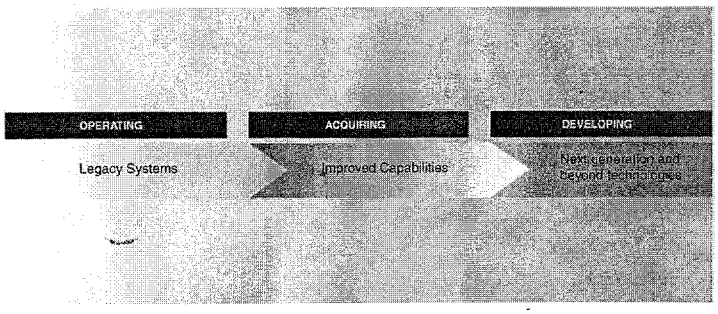
> *The significant degree of change in a relatively short period of time has put great strain on the NRO and its personnel and has presented a continuing series of challenges to senior NRO managers.*

decisions to pursue high-risk technologies in response to objectives established by the national leadership. As a result, the NRO was able to develop airborne and satellite reconnaissance systems that provided a decisive edge to the United States in its decades-long confrontation with the Soviet Union.

Today's NRO, by contrast, has evolved into a large organization with three main responsibilities:

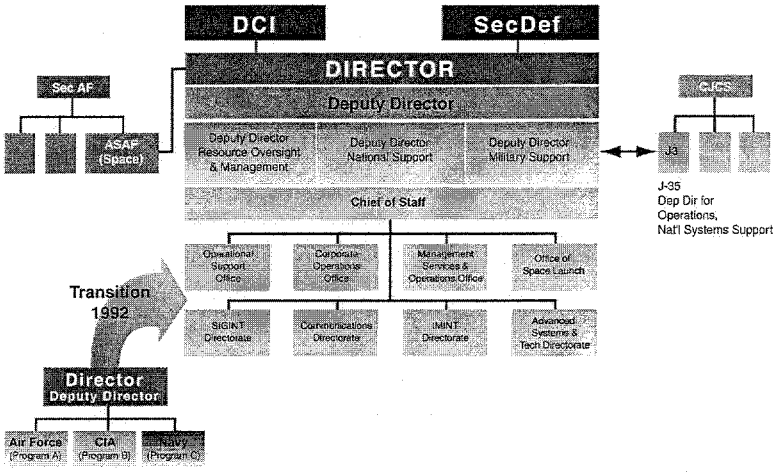
- operating the mainstay satellite reconnaissance systems that now serve a large number of tactical customers as well as strategic or "national" customers;
- acquiring new satellite collection systems that maintain continuity in the data provided to customers and include evolutionary improvements in technology; and
- conducting leading edge research and technology innovation for future satellite systems that will guarantee global information superiority and continued access to denied areas.

## NRO Responsibilities



A decision was made in 1992 to consolidate the original NRO programs (Programs A, B and C) into an organization divided along functional lines, e.g., imagery intelligence (IMINT), signals intelligence (SIGINT), etc. The intent was to gain efficiencies, eliminate redundancies and develop a more centralized and more "corporate" structure for the NRO. (See graphic, "NRO Organization.")

## NRO Organization




The consolidation was followed by a period of significant upheaval at the NRO. In 1996, a controversy concerning the financial management of the organization led to the replacement of the NRO Director. The increased congressional, DoD and Intelligence Community oversight that resulted inevitably influenced the NRO's organizational practices and management structure. The end result was a larger organizational structure with additional administrative and support functions.

In response to the management challenges presented by the functional consolidation of the NRO and the financial management controversy that had led to the removal of his predecessor, then-Acting NRO Director Keith Hall established a Blue Ribbon group—known as the Jeremiah Panel after its Chairman, Admiral David Jeremiah, a former Vice Chairman of the Joint Chiefs of Staff. Its role was to review the NRO's practices and organization and make recommendations concerning how the NRO should position itself for the future.

After being confirmed by the Senate, NRO Director Hall began to implement the recommendations of the Jeremiah Panel by:

- restructuring the NRO's internal organization in an attempt to increase its responsiveness to its customers;
- establishing collaborative relationships with the NRO's mission partners—NIMA and NSA—and its customers throughout the U.S. Government;
- increasing and stabilizing the level of research and development funding and concentrating those activities in a single, more independent Advanced Systems and Technology Directorate;
- making NRO systems more tactically relevant by involving DoD in the development of requirements for the next generation NRO imagery satellite system, known as the Future Imagery Architecture;
- facilitating more effective means for processing and disseminating data derived from NRO systems;
- placing increased emphasis on information superiority; and
- changing the NRO's acquisition processes.

In addition to these reform efforts, the NRO was under congressional direction to tighten its internal budgetary controls and strengthen internal oversight mechanisms such as the Office of Inspector General. As mentioned earlier, the end result was a larger organizational structure with added administrative and support functions.

Furthermore, the NRO must now operate in the changed environment that includes many diverse customers and mission partners that have the responsibility for tasking NRO systems and exploiting and disseminating the intelligence data they produce. This significant degree of change in a relatively short period of time has put great strain on the NRO and its personnel and has presented a continuing series of challenges to senior NRO managers.

Finally, and most unfortunately, the NRO no longer commands the personal attention of the President, the Secretary of Defense, the DCI, or senior White House officials with regard to its technology and system acquisition decisions. This reduced attention from the national leadership has come at a time when the challenges to U.S. national security are as threatening and unpredictable as they have ever been. The nation's future security will require decisive leadership, clear direction and attention to detail to ensure the NRO and Intelligence Community are positioned to meet the intelligence challenges facing the United States in the 21st Century.

## Changing NRO Responsibilities

Throughout its history, the NRO has met the challenge of providing innovative, space-based reconnaissance solutions to difficult intelligence problems. Since the earliest days of the Corona spy

*Today's NRO must ensure the operation of its large mainstay systems, while simultaneously acquiring evolutionary upgraded systems and developing future technologies.*

satellites when the NRO developed the first space-based photographic capability, the NRO has remained on the leading edge of space technology.

As explained earlier, today's NRO has three parallel responsibilities. It must ensure the operation of its large mainstay systems, while simultaneously acquiring evolutionary upgraded systems and developing future technologies. It must do all of this in a new environment that includes many more customers and mission partners.

The NRO has rendered extremely valuable non-space-related services over the years by providing terrestrial communications systems, visualization tools, imagery exploitation systems, and technical problem-solving skills to U.S. combatant commands and military departments when no other entity was willing, capable, or agile enough to do so. However, such activities have tended to divert the NRO's attention from what it is best suited to do: design, acquire and launch reconnaissance satellites that can help resolve the most difficult intelligence collection problems.

The Commission reviewed three types of proposals for altering the NRO's activities in order to focus the NRO on pursuing and applying advanced space-based or space-related technologies:

- transferring systems;
- transferring functions; and
- limiting the NRO's role in tasking, processing, exploitation, and dissemination.

**Proposed Transfer of Systems.** The Commission received testimony advocating the transfer of some NRO activities and operations to DoD. Such an approach was advocated in order to:

- enable the NRO to focus on developing unique space-based collection systems to solve difficult intelligence problems; and
- allow DoD to be responsible for developing and operating those space systems that are better suited to satisfying the needs of its military commanders.

Combatant Commanders and military departments now have specific validated requirements for space collection systems. Moreover, the military departments are charged by statute to "organize, train and equip" U.S. military forces and may be better positioned to accept responsibility for the space systems that are increasingly relied upon by the military and integrated into its weapons systems.

As discussed elsewhere in this Report, tensions have been heightened regarding the use of NRO systems to support both strategic and tactical customers. Transferring development or operational responsibilities for these systems to DoD would place an enormous burden on DoD to demonstrate that it could satisfy both sets of requirements.

Further, NRO satellites are substantially more complex than DoD satellites, so that the associated expertise would also have to be transferred in conjunction with any transfer of operational responsibilities. DoD's ability to operate space systems may be more advanced now than in the past, but any such transfer would require that such activities be staffed with an adequate force of contractors and military engineering personnel sufficiently

proficient to understand the more complex NRO systems. In this regard, the Commission notes that the Air Force's Space Based Infrared System satellite program offers an opportunity for the Air Force to demonstrate the capability to acquire, operate and maintain an actively tasked collection system similar in complexity to NRO systems.

On balance, the Commission is not persuaded that such transfers are warranted at this time, and notes that the minimum criteria that should be satisfied before such transfers of responsibility could be considered include:

- demonstrated clear and discrete benefits to all military, intelligence and other customers;
- creation of additional opportunities for the NRO to focus its resources and intellectual capital on critical technology development activities; and
- guarantees that the necessary expertise is readily available within or transferred to the receiving entity to operate or develop these systems effectively in light of their unique complexities.

**Proposed Transfer of Functions.** Current divisions of responsibility for the production of imagery intelligence (IMINT), signals intelligence (SIGINT) and measurement and signature (MASINT) intelligence, as well as budget and mission distinctions among the NRO and its mission partners, are not as clear as they should be. To deal with these issues, it was suggested in testimony that NRO SIGINT and IMINT research and development activities, or the entirety of the NRO's SIGINT and IMINT organizations, be assigned to NSA and NIMA, respectively.

The Commission believes transfers of SIGINT and IMINT responsibilities from the NRO to NSA and NIMA could be destructive of U.S. capabilities to collect intelligence from space in

the long run. NSA and NIMA are directly responsible for providing SIGINT and IMINT to U.S. Government officials and military forces. They face voracious current and near-term demands for these products. Thus, budget and program pressures would tempt these agencies to take resources from the development of future space-based capabilities and devote them instead to current collection, analysis and production programs.

**The NRO's Role in Tasking, Processing, Exploitation, and Dissemination (TPED).** Serious questions have been raised by the NRO's customers and mission partners regarding the appropriate nature and scope of the NRO's role in tasking, processing, exploitation, and dissemination (TPED) functions. The TPED area is an example of the type of problems associated with NRO participation in activities that can be accommodated within the terms of the NRO's current Mission Statement because they are related to intelligence, yet are not space-related.

The NRO has often approached its mission from an "end-to-end" perspective. Not only did the NRO build satellites to collect information, it built capabilities to task the satellites, process the information they collected and disseminate it to its primary users. By taking this comprehensive approach, the NRO was able to develop advanced satellite systems and associated capabilities that better served its customers' needs.

However, the structure of the Intelligence Community has changed. New organizations exist and many intelligence functions are now shared. Tasking, processing, exploitation, and dissemination functions are dispersed throughout the Intelligence Community. Some officials are concerned the NRO is duplicating efforts in areas for which other agencies now have primary responsibility.

The National Security Agency, the National Imagery and Mapping Agency and the Central MASINT Organization bear primary responsibility for tasking NRO systems, processing the data

they collect and disseminating the information. At the same time, the NRO is responsible for ensuring its satellites operate efficiently and effectively.

In developing TPED processes in connection with its own systems, the NRO often has found innovative solutions to difficult problems in these areas. The Commission recognizes the NRO has expertise that can be applied profitably to developing future TPED processes. However, the basic role of the NRO should be to support its mission partners who have primary responsibility for the TPED mission.

To ensure the design and acquisition of future satellite collection systems fully incorporates TPED processes, the Commission believes it important that the responsibilities for TPED be carefully delineated. The Secretary of Defense and DCI should carefully review the assignment of TPED responsibilities and ensure that satellite collection capabilities do not outstrip TPED capacities and that future NRO satellite acquisitions address the responsibility and funding for end-to-end integration of TPED functions.

## Recommendations

- **The Secretary of Defense and Director of Central Intelligence must direct that the NRO mission be updated and focused as a first priority on the development, acquisition and operation of highly advanced technology for space reconnaissance systems and supporting space-related intelligence activities, in accordance with current law.**
- **The Secretary of Defense and Director of Central Intelligence should determine the proper roles for the NRO, National Security Agency, National Imagery and Mapping Agency, and Central MASINT Organization in tasking, processing, exploitation, and dissemination activities.**

## NRO Technological Innovation

From the NRO's inception, its core function has been the acquisition and application of new, advanced and synergistic technologies. Indeed, one key reason for creating it was in part to facilitate the process of conducting focused research and development (R&D) and the development of plans, policies, procedures, and other mechanisms to integrate "leap ahead" and "revolutionary" technologies into the space reconnaissance effort.

> *The key to future space-based access and to future capability in the face of actions by those who would conceal their own capability, intent and will is technology.*

The NRO gained a well-deserved reputation, over time, as the preeminent research, development and acquisition (RD&A) organization in the Intelligence Community and in DoD. This reputation spread into the commercial and private RD&A and production communities, and to this day the NRO enjoys a reputation among the contractor community as the easiest and most effective element of the U.S. Government to deal with in these endeavors.

However, increasing bureaucracy and other changes in the NRO's organizational and operating structure have begun to take their toll. Some critics, commercial and governmental, who appeared before the Commission, speculated or asserted that the NRO had lost its streamlined acquisition and integration capability, and had lost its edge with regard to the development and application of new technologies.

The Commission believes that the NRO is clearly embracing its role in RD&A, in accepting new ideas, concepts and base technologies from any source, and in applying these "leap ahead" and "revolutionary" technologies to its work. The NRO has several programs for outreach to the private, individual and commercial

communities, to laboratories and to academia. However, it must then evaluate and assess the "next great idea" or the "best technology anyone ever heard of" in the harsh light of science and engineering and in the cold context of resource limitations.

It is apparent that the NRO is working on innovative and synergistic technologies. Its focus is as it should be—on technologies that will enhance, improve, or even fundamentally change the way in which the United States engages in space-based reconnaissance. In order to find and develop the required technologies, the NRO has few limits. It is true that a variety of rules and regulations have been inserted into its "streamlined" acquisition process, with good reason, to ensure that tax dollars are spent effectively and efficiently. It is still apparent, however, that the NRO can and does get things done as fast as any agency in the U.S. Government, especially with regard to the insertion of "change" technologies.

One key shortcoming in the current NRO process for "operationalizing" technology is the decision-making process following the research and development phase to acquire and apply the technology. Much of what the NRO does in operationalizing technology is now viewed by critics and supporters alike as evolutionary rather than revolutionary. This is an accurate perception. It reflects the reality of the current decision process. That process has devolved over the years from an examination of the technologies and an appraisal of their merits, to the budget process, in which technologies are evaluated largely according to resource considerations.

Not only is the budget mechanism ill-suited to be the most influential decision-making element in the review of new technologies, but the people in that process are seldom equipped to make good technology judgments. In fact, general knowledge about what the NRO does and how it does it, and for what reasons, is sadly lacking outside the NRO. Even inside the NRO, some personnel are

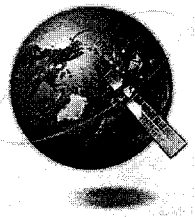
not fully aware of organizational goals with regard to technology applications. Decision-makers and leaders must somehow be equipped with the information and understanding they need to make good decisions.

**As the nation moves into the future, the traditional strength of NRO systems to transcend geopolitical limits and to look into restricted or denied areas in any conditions will become more important than ever.** Many, if not most, of our adversaries know this all too well. They have taken extraordinary steps to harden and protect their capabilities and to deny access. The key to future space-based access and to future capability in the face of actions by those who would conceal their own capability, intent and will is technology.

This simple concept is all-important. It sums up the reason for the Commission's view that technology is a vital component of ensuring U.S. preeminence in knowledge about developments worldwide. The Commission urges the NRO to ensure that we remain on or ahead of the leading edge of the technology revolution.

## Recommendations

- **The President of the United States, the Secretary of Defense and the Director of Central Intelligence must pay close attention to the level of funding and support for the NRO Director's research, development and acquisition effort.**
- **The Secretary of Defense and Director of Central Intelligence should ensure common understanding of the NRO's current and future capabilities and the application of its technology to satisfy the needs of its mission partners and customers.**



# PREPARING THE NRO FOR THE FUTURE

Timely, high quality space reconnaissance based on technological innovation is of crucial importance to both strategic and tactical decision-makers. To provide this, the NRO must constantly engage in the most advanced research, development and acquisition efforts so that it can continue to place the latest and best reconnaissance capabilities in orbit. The Commission concludes that significant actions must be taken to enable it to do so, and that these actions should reflect those qualities, characteristics and attributes, as summarized below, that enabled the NRO to achieve its great past successes.

*The NRO must constantly engage in the most advanced research, development and acquisition efforts so that it can continue to place the latest and best reconnaissance capabilities in orbit.*

**Engineering Creativity.** While new NRO systems have responded to the desires of external customers, NRO engineers have also been free to pursue "the art of the possible" and to develop new technological solutions to solve intelligence problems whenever feasible. This has allowed NRO engineers to focus on improving system performance, rather than being limited by rigid, consensus-driven customer requirements. Given wider latitude, they have been more creative. Thus, the NRO is accustomed to delivering first-of-a-kind satellites.

**Performance First.** In making design choices for new NRO systems and upgrades, superior satellite performance has been considered more important than constraining costs. Budget

constraints have not been ignored, but sufficient funds have been made available to the NRO to pursue promising new technologies.

**End-to-End Systems Approach.** The NRO's distinctive approach has included end-to-end development of space reconnaissance systems. While developing a concept of operations for a future satellite system, NRO program developers considered how, by whom and under what conditions the system would be tasked. While determining how raw satellite data would be transformed into a useful product, they considered mission ground station operations. In some cases, they actually developed TPED tools and techniques to be used in conjunction with the new satellite system. Understanding the entire process permitted the development of break-through satellite systems and the capabilities required to support them.

**Cradle-to-Grave Perspective.** In some cases, NRO engineers have also operated the satellites they designed and built, thus developing unique and important insights into possible future capabilities. Among other things, solving on-orbit anomalies, watching and understanding the changes in intelligence targets, and incorporating new hardware and software upgrades have contributed to a thorough NRO understanding of space reconnaissance systems and the targets they must attack.

**Senior Level Attention.** One of the most important reasons for the NRO's success has been the partnership between the Secretary of Defense and the DCI, explained in further detail in this Report, that has permitted the creation of a single vision for space reconnaissance and allowed the NRO to operate differently than other activities in the national security community.

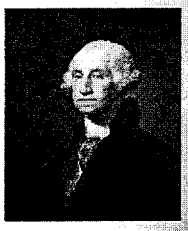
From its earliest days, the NRO collected information essential to strategic and tactical decision-makers. Part of the DCI's contribution to the partnership has been advocacy, on behalf of the

Intelligence Community, for crucial strategic intelligence collection that can only be conducted from space. As the President's primary intelligence advisor, the DCI requires substantial amounts of such information. At the same time, the Secretary of Defense, representing the other half of the partnership, requires NRO information to ensure global situational awareness and battlefield information dominance for his military commanders.

**Special Authorities.** The Secretary of Defense-DCI partnership also has provided the NRO with the authority to use extraordinary policies and procedures to advance its efforts. Among these are the NRO's exemption from normal DoD procurement policies, procedures and regulations. The NRO has also been allowed to use the DCI's special statutory procurement authorities under Title 50 of the U.S. Code. These authorities helped provide the foundation for the NRO's unique acquisition process and its exceptional relationships with contractors.

**Unified Direction.** The Secretary of Defense and DCI agreed to establish a single NRO Director with a single vision based upon a single space reconnaissance budget. Internal disagreements involving competing demands for constrained NRO resources are settled by one Director within one organization, based upon an understanding that space reconnaissance is essential for the success of DoD and the Intelligence Community.

## Need for Secrecy



*"The necessity of procuring good intelligence is apparent...All that remains for me to add is, that you keep the whole matter as secret as possible. For upon Secrecy, Success depends...and for want of it, they are generally defeated."*

General George Washington
letter to Colonel Elias Dayton
July 26, 1777

**Special Security Protections.** Until 1992, the NRO was surrounded by a wall

of secrecy. This environment kept foreign intelligence services from gaining a comprehensive understanding of U.S. space reconnaissance capabilities. The absence of information on NRO spacecraft attributes, sensors and its approach to the development of new technology hampered those who intended to use cover and denial and deception techniques to counter U.S. space reconnaissance. As a result, knowledge of the NRO was limited.

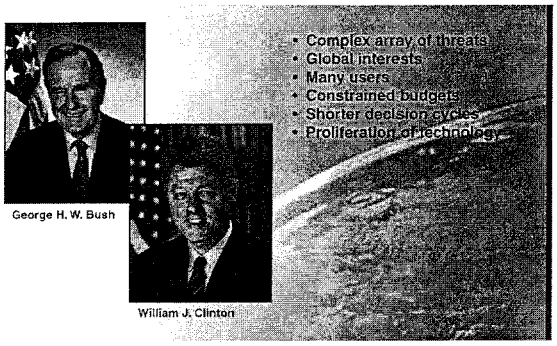
**Experienced Program Managers.** NRO program managers have been experienced military and CIA acquisition officers. Many have spent almost their entire careers within the NRO working in many different capacities. Because they were highly qualified acquisition professionals and understood NRO activities so well, they required little supervision and were empowered to make decisions not normally made at their level in other parts of the U.S. Government. They could reallocate funds to meet unforeseen circumstances and could take advantage of opportunities to adopt new technologies. With clear guidance from senior Government officials and sufficient resources, they were able to make decisions in technically risky programs and produce very successful, advanced space reconnaissance systems.

**The Impact of Change.** The current environment within which the NRO must operate has had an unfortunate effect on these characteristics, which have been so important for the NRO's past successes. For example, the integration of NRO information into many day-to-day decision-making processes has made many national security professionals very familiar with NRO programs. Many have come to expect the NRO to adapt to standard procedures in order to accommodate the needs of a wide array of customers.

The NRO now must respond to rigid requirements for new reconnaissance systems, based on extensive negotiations among a wide variety of strategic and tactical customers. Because

resources are constrained across the Intelligence Community, cost constraints have become an increasingly important element in decisions on new NRO programs.

**A New Operating Environment For The NRO**
(1990-21st Century)




There have been other important changes. The Secretary of Defense-DCI partnership is being managed to a large extent by subordinates or staffs. The NRO is now a publicly acknowledged organization. Some of its latest space reconnaissance initiatives are well-publicized and NRO systems are analyzed and discussed on the Internet.

Thus, the NRO is operating under very different conditions from those under which it achieved its greatest successes. Nonetheless, new, extremely difficult intelligence problems will continue to arise that will require frequent, assured, global access to denied areas. This is the NRO's unique contribution to intelligence and should be the driving force behind its efforts.

## The Office Of Space Reconnaissance

Because of the NRO's changed circumstances, the Commission concludes that the NRO Director must free his most advanced research, development and acquisition efforts from processes that inhibit his ability to place the latest and best reconnaissance capabilities on orbit quickly. The Commission

believes the best way to do this is to create a new office that builds on the sources of the NRO's past successes and reflects the characteristics of its successful programs. It suggests the new office be called the Office of Space Reconnaissance (OSR).

The first and foremost premise in establishing this Office must be that it responds only to requirements from the President, Secretary of Defense and DCI through an Executive Committee (EXCOM) and to congressional oversight. By implication, the Office's budget would be relatively small and it would focus only on the most significant problems confronting the three principal decision-makers and that require space-based reconnaissance solutions. Because these officials would give the new Office their personal attention, they would exempt the Office from normal DoD acquisition regulations and allow it to use, when appropriate, the DCI's special authorities under 50 U.S.C. 403j. Further, their personal involvement and support would give important impetus to the Office's programs as they wind their way through the complicated budget and oversight process.

Second, the Office would focus narrowly on high technology solutions to the most difficult intelligence problems based on the requirement to gain frequent, assured, global access to denied areas. This could produce space collection systems at least two generations ahead of the rest of the world. The President, Secretary of Defense and DCI would personally identify the problems and approve the new Office's proposed solutions.

The third premise for the new Office is that it should be under the control and direction of the NRO Director. A single overall vision for space reconnaissance must be retained, and that vision is best vested in the NRO Director.

Fourth, the Office must be staffed by both military and CIA personnel. They bring the separate perspectives of strategic and tactical customers to the program level of decision-making. The

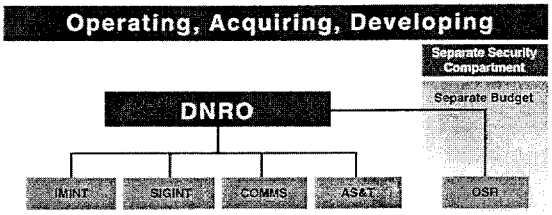
Commission anticipates they would be senior grade officers with broad backgrounds in space reconnaissance and with extensive experience in program management and acquisition. Their experience and background should be sufficient to give their supervisors and those with oversight responsibilities, including the Congress, confidence in the Office's program management. As a result, Office managers would have the power to make risky technical decisions that are often needed.

Fifth, the Office would approach space reconnaissance programs from end-to-end and cradle-to-grave perspectives. Its solutions would be comprehensive, beginning with effective and efficient tasking of a space reconnaissance system and ending with at least a plan for the dissemination of its products.

Sixth, the Office would operate from facilities separate from other space reconnaissance activities, and it would be covered by a new security compartment. The purpose would be to establish effective secrecy to shield the technologies and collection techniques under development. Accordingly, the Office would have a greater likelihood of defeating adversary attempts to employ cover and denial and deception techniques.

The Office also would have a separate budget element included in the National Foreign Intelligence Program. The Commission envisions that funds for the new budget of the Office of Space Reconnaissance would come initially from the National Reconnaissance Program. The Commission has taken this approach so as to avoid simply recommending that more funds be committed to space reconnaissance. It believes the creation of the new Office will focus senior level attention on high-end space reconnaissance solutions to the most difficult intelligence problems. Further, the Commission believes that, by having the new Office create and defend its own budget, its advanced research, development and acquisition programs would succeed or fail based on their own merits.

## NRO / OSR Organizational Relationships




The Office of Space Reconnaissance would be separate from the NRO in many aspects. It would have a separate budget, separate facilities, a separate security compartment, and separate program managers. However, the NRO Director's (DNRO) relevant corporate structure should be sufficient to support its activities.

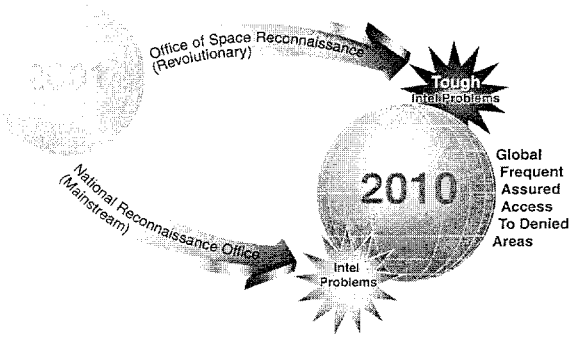
The Commission believes a new Office operating under the specific guidance of the President, Secretary of Defense and DCI would be better postured to place the most advanced reconnaissance capabilities into space than would the current NRO operating mechanisms. Those who oversee and supervise space reconnaissance activities, including those in Congress, should have greater confidence in the importance of programs personally supported by the President, Secretary of Defense and DCI.

Additionally, a smaller budget supporting fewer programs should enable supervisors and those with oversight responsibilities to have a more thorough understanding of each program and the significance of the technology involved. This in turn should give them greater assurance that technical decisions made at the program level are correct and further reduce tendencies to hold back technology development solely for cost reasons.

Finally, the Office's new security compartment would permit access only to those with oversight responsibilities who have an absolute need-to-know. A proper balance must be struck, however, in which secrecy is sufficient to frustrate adversaries using cover

and denial and deception techniques, while at the same time care is given to protect only essential information.

The Commission emphasizes that creation of the Office of Space Reconnaissance does not diminish the fundamental importance of the NRO and its mission. As noted throughout this Report, the Commission finds the NRO is responding appropriately to the changed circumstances confronting it. The Commission believes the NRO must continue along the path it is following in order to serve a broad strategic and tactical customer base.




The NRO must continue to evaluate and put into place leading edge technologies to improve space reconnaissance and to meet the needs of its broad customer base. It also must develop and operate space reconnaissance systems to overcome the intelligence problems confronting this same customer base. It must acquire and operate high-technology spacecraft on behalf of the Secretary of Defense and DCI to gain frequent, assured access to denied areas on a global basis.

## Recommendation

- **The Secretary of Defense and the Director of Central Intelligence should establish a new Office of Space Reconnaissance under the direction of the Director of the NRO. The Office should have special acquisition**

**authorities, be staffed by experienced military and CIA personnel, have a budget separate from other agencies and activities within the National Foreign Intelligence Program, be protected by a special security compartment, and operate under the personal direction of the President, Secretary of Defense and Director of Central Intelligence.**

## The Secretary of Defense-Director of Central Intelligence Relationship

The Commission has emphasized the need for the Secretary of Defense and DCI to be fully aware of, and engaged in, NRO program decisions. In that light, the Commission has reviewed the Secretary of Defense and DCI responsibilities regarding the NRO.

*The tri-cornered arrangement among the Secretary of Defense, DCI and NRO Director has at times provided great strength to the NRO because it has allowed the NRO Director to draw on the resources and benefit from the advocacy of the two major forces in the Intelligence Community and DoD.*

The NRO Director is the head of an agency of DoD that is also a major component of the Intelligence Community. In addition, he serves as the Assistant Secretary of the Air Force for Space. Under four agreements dating back to the 1960s, the Director of the NRO is responsible for reporting to both the Secretary of Defense and the DCI. According to the NRO's General Counsel, all four agreements are considered by the NRO to be still in effect, although more recent statutory and Executive Order provisions have added significant structure to the relationship. (See box on facing page, "Summary of Secretary of Defense—DCI Agreements Pertaining to the NRO." Also, a more detailed explanation of the agreements and the historical development of the Secretary of Defense-DCI relationship regarding the NRO is included in Appendix D.)

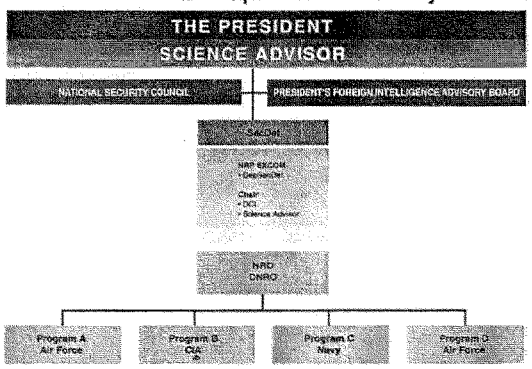
### Summary of Secretary of Defense—DCI Agreements Pertaining to the NRO

The first agreement (1961) created the NRO to manage a DoD National Reconnaissance Program (NRP) that included all overt and covert satellite and over-flight reconnaissance projects. The NRO was to function under the joint direction of the Under Secretary of the Air Force and the CIA's Deputy Director for Plans. Major NRP program elements and operations were to be subject to regular review by a National Security Council group.

A second agreement (1962) provided that the NRO Director would be designated by both the DCI and Secretary of Defense and be responsible directly to them for management of the NRP. DoD and CIA personnel were to be assigned to the NRO and DoD and CIA were to provide funds for the NRO projects for which they were responsible.

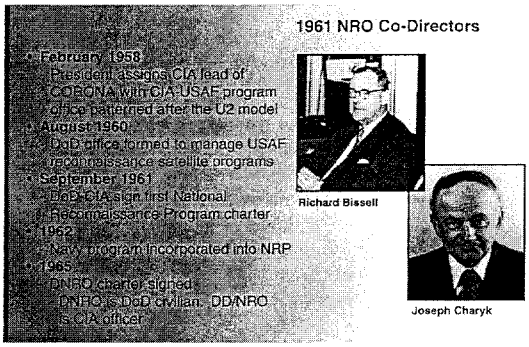
In 1963, a third agreement superseded the prior version and identified the Secretary of Defense as the Executive Agent for the NRP and the NRO as a separate operating agency within DoD. The NRO Director was now to be appointed by the Secretary, with the concurrence of the DCI. A Deputy NRO Director was to be appointed by the DCI, with the concurrence of the Secretary. NRO budget requests were to be presented by the NRO Director to the Secretary and DCI, the Bureau of the Budget and congressional committees. The NRO Director was to report directly to the Secretary of Defense, while keeping the DCI currently informed.

**Streamlined NRO Acquisition Authority 1965-1972**




The last agreement (1965) made clear the Secretary of Defense had "ultimate responsibility" for the NRO and eliminated the requirement for DCI concurrence in the selection of the NRO Director. The DCI retained authority for appointing the Deputy NRO Director, but with the concurrence of the Secretary. This agreement also provided that the Secretary was the final decision-maker for the NRP budget and all NRP issues. It created an NRP Executive Committee (EXCOM)—consisting of the Deputy Secretary of Defense, DCI and the Assistant to the President for Science and Technology—to "guide and participate" in NRP budget and operational decisions, but the Secretary of Defense was responsible for deciding any EXCOM disagreements.

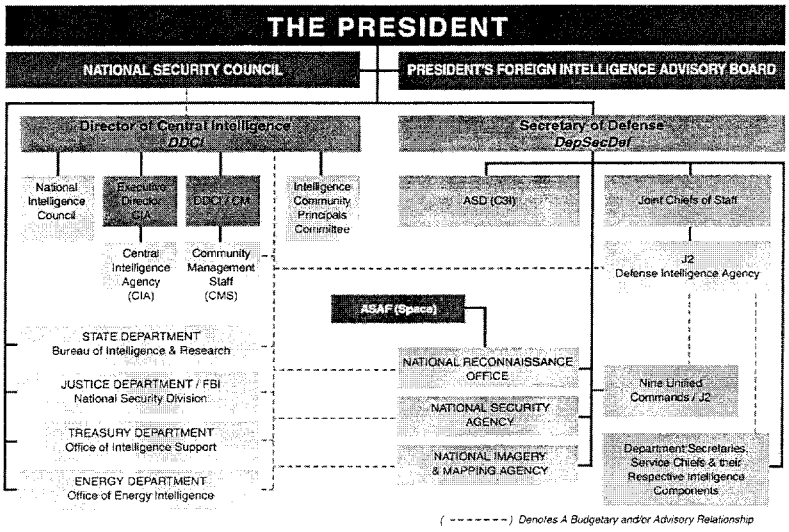
### A Unique Partnership Evolves




The tri-cornered arrangement among the Secretary of Defense, DCI and NRO Director has at times provided great strength to the NRO because it has allowed the NRO Director to draw on the resources and benefit from the advocacy of the two major forces in the Intelligence Community and DoD. To some degree, however, the uncertain situation in which the NRO finds itself today—requirements rising, budgets level or falling, and customers and mission partners demanding greater roles in the NRO's decision-making process—can be traced to the ambiguity and recent inadequacy of the Secretary of Defense-DCI relationship as a means of resolving disputes relating to the NRO.

The Commission believes history has shown it is possible for the NRO Director to be responsive to both the Secretary of Defense and DCI and that the dual reporting arrangement is valuable for the NRO Director and should be continued. In previous years, for example, the Secretary of Defense and DCI held weekly meetings that allowed intelligence-related issues to be raised and resolved quickly without having to percolate through the many layers of bureaucracy that have come to separate the two officials from the NRO Director. (See graphic, "Management Structure for the Intelligence Community.") However, the Commission recognizes the relationship is not self-executing and that its success requires the active participation of both parties.

## Management Structure for the Intelligence Community




The Secretary or the DCI may choose not to pursue this relationship. Successively lower levels of officials may then be left to "manage" the NRO on behalf of the two principals. Friction among the NRO, the Intelligence Community and DoD has developed in such periods. The Commission believes that the Secretary of Defense and DCI must be involved in managing the NRO and that a close working relationship must be established between them for this purpose.

The Secretary of Defense-DCI relationship with regard to the NRO could be embodied in a comprehensive statute, as there is for NIMA, or it could be established by statute mandating its

completion by a date certain. Alternatively, relatively minor amendments could be made to the existing statutory scheme that would have significant impact on the relationship. The relationship also could be established by Executive Order or some other form of Presidential Directive, a combination of statutory and Executive Branch provisions, or a new agreement between the Secretary of Defense and the DCI that would take account of the many changes in the relationship that have occurred since 1965, the date of the last of the previous agreements.

The Commission evaluated the desirability of recommending the creation of an "NRO statute." Such a law could firmly secure the NRO's position in the national security community. After debate, the Commission concluded that congressional action in this regard could make the situation worse, rather than better. It believes senior level Executive Branch attention should be sufficient at this time.

## Recommendations

- **The President must take direct responsibility to ensure that the Secretary of Defense and Director of Central Intelligence relationship regarding the management of the NRO is functioning effectively.**
- **The President should direct the development of a contemporary statement defining the relationship between the Secretary of Defense and Director of Central Intelligence with regard to their management of the NRO.**

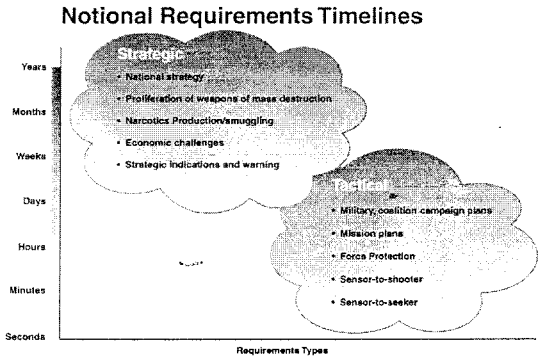
## Balanced Response to Customer Demands

Strategic and tactical intelligence requirements determine the targets against which current NRO systems collect every day. They also have a direct and substantial impact on the design parameters of future NRO systems.

***Ensuring a proper balance between strategic and tactical requirements—in terms both of the use of current NRO systems and in the design of future NRO systems—is a matter of utmost national security importance.***

Tactical requirements include those generated by the Defense Intelligence Agency, the military departments of DoD and the commanders of the various U.S. military commands. They are generated in furtherance of the U.S. military's responsibility to cope with contingencies in any area of the world, to support the worldwide deployment of U.S. armed forces and to organize, train and equip forces for future military operations.

Strategic requirements, on the other hand, include those generated by the National Security Council, CIA, DoD, State Department, and other civilian departments and agencies. These requirements support U.S. Government policy officials, including those in the White House and



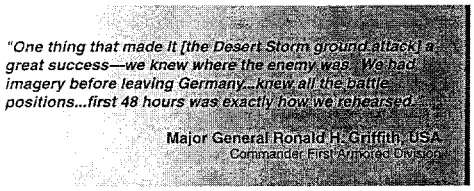
throughout the various departments and agencies of the U.S. Government who participate in the development of U.S. foreign, defense, military, economic, and technology policies.

An extensive debate has been underway for some time over whether NRO collection resources are being properly allocated between strategic and tactical intelligence requirements. The Jeremiah Panel, referred to earlier, reviewed the state of the NRO and reported in 1996 that both strategic and tactical customers of the NRO were frustrated with the requirements processes for both future systems and daily operations. According to the Panel report, tactical customers believed there was an insufficient NRO commitment to satisfying their needs, while strategic customers believed that overhead systems were being used, and future systems designed, primarily for tactical customers and to the detriment of strategic customers.

The NRO Director identified this tension between the NRO's strategic and tactical customers as the first issue the Commission should address because there is a belief that the NRO is responsible when requirements are not satisfied. Substantial as the NRO's present collection resources are, they cannot satisfy all requirements all the time. Nor will future NRO systems, including the Future Imagery Architecture, be able to satisfy all the needs of both strategic and tactical customers. The NRO is thus caught in the middle of the debate over the respective extents to which strategic and tactical requirements should be satisfied by its current systems and over the influence of those requirements on the design of its future systems.

The classification level of much of the data produced by NRO systems was lowered during and after the Gulf War in response to congressional and military pressure to make it more readily available to military commanders in the field. As explained earlier, this action removed the veil of compartmented secrecy from the NRO.

## NRO Support to Military Operations




In addition, following the Gulf War, Congress emphasized the need to expand the use of NRO systems to support military operations.

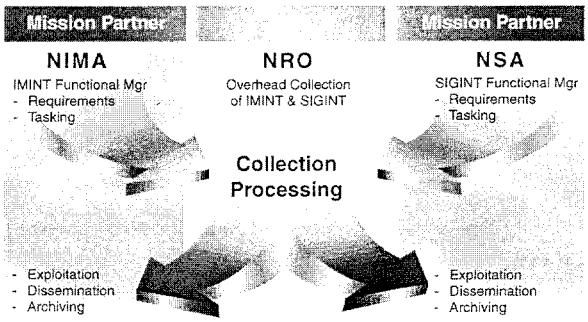
These developments have brought a substantial increase in NRO collection requirements. But there has been no corresponding increase in NRO funding. As has been explained elsewhere in this Report, the program for providing additional funds to the NRO from the DoD budget through the Defense Space Reconnaissance Program for activities related to military-unique requirements was eliminated in 1994. Without such compensating resources, the shift toward expanded support for military operations has stressed the capacities of NRO systems to satisfy strategic, longer-term intelligence needs.

The Commission believes that ensuring a proper balance between strategic and tactical requirements—in terms both of the use of current NRO systems and of the design of future NRO systems—is a matter of utmost national security importance. Factors that have made this an issue include the growing expectations of the NRO's expanding customer base and the lack of an effective policy structure to clarify the NRO's mission and the allocation of its resources in the face of these competing demands.

There also appears to be no effective mechanism to alert policy-makers to the negative impact on strategic requirements that may result from strict adherence to the current Presidential Decision Directive (PDD-35) assigning top priority to military force protection. That Directive has not been reviewed recently to determine whether it has been properly applied and should remain in effect.

It also is significant that the interagency committees and components that consider requirements for NRO systems were moved out of the DCI's Intelligence Community management structure in the early 1990s. These are now managed by the agencies with functional responsibilities for the management of signals intelligence (SIGINT) and imagery intelligence (IMINT), NSA and NIMA, rather than being directed by officials with a broader view of the needs of the Intelligence Community.

**NRO - NSA - NIMA Relationships**

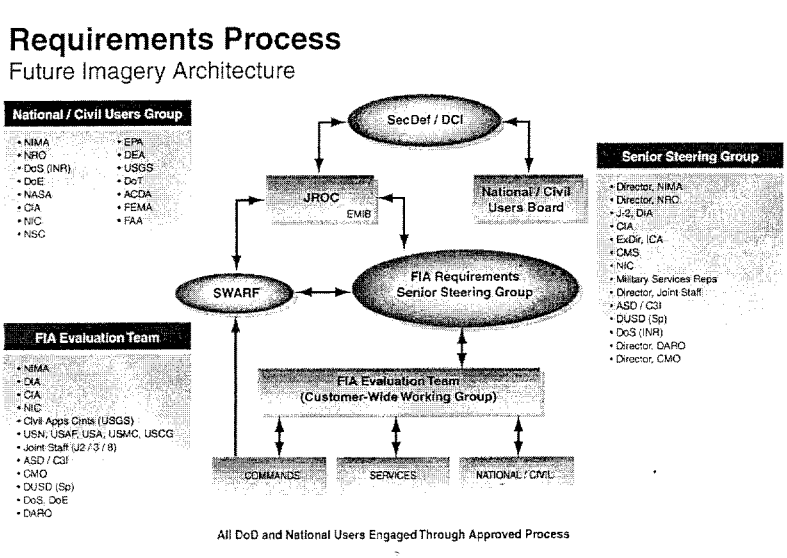



Day-to-day collection requirements for current NRO IMINT systems are managed by NIMA through an interagency process that includes representatives of both the national and military customers. This process allocates tasking of NRO imagery systems according to standing requirements based on predetermined intelligence priorities. It allocates daily tasking of these NRO systems in response to ad hoc requirements, driven by current events, that may warrant a higher collection priority. A similar, but somewhat more complicated, process regarding collection requirements for NRO SIGINT systems is managed by NSA.

Requirements that will affect the design of future NRO IMINT and SIGINT systems must be developed, presented and justified prior to the design of those systems. This is a more technical and detailed process than that for current requirements, and it may

take months or years. It also requires a sophisticated assessment by the NRO and others of the cost and feasibility of providing the technology needed to satisfy the various requirements set forth by the customers. The most recent example was the 18-month requirements process for the NRO's Future Imagery Architecture (FIA).

In the FIA requirements process, the DoD customers benefited from a well-established and systematic DoD requirements review process. To aid non-DoD customers in developing and justifying




such requirements in the future, a Mission Requirements Board has been created under the Deputy Director of Central Intelligence for Community Management. If this Board functions properly, it should allow strategic customers to compete on a more even footing with the tactical customers.

It is clear to the Commission that, in this area as well, it is up to the President, Secretary of Defense and DCI to ensure that the priority needs of both the strategic and tactical customers of intelligence from NRO systems are satisfied now and in the future. The Commission believes that direct and sustained attention by the Secretary of Defense and the DCI is needed to resolve the current debate in a way that ensures sufficient and proper coverage of both strategic and tactical intelligence requirements by current and future NRO reconnaissance systems.

In any event, the President has assigned the highest current priority to collection of intelligence in support of deployed U.S. military forces. So long as this is the case, the needs of the strategic customers will continue to be given secondary priority whenever the two types of requirements conflict and the NRO systems cannot accommodate both.

## Recommendations

- **The Secretary of Defense and the Director of Central Intelligence must work closely together to ensure that proper attention is focused on achieving the appropriate balance between strategic and tactical requirements for NRO systems, present and future.**
- **The Presidential Decision Directive (PDD-35) that establishes priorities for intelligence collection should be reviewed to determine whether it has been properly applied and should remain in effect or be revised.**
- **The imagery intelligence and signals intelligence requirements committees should be returned to the Director of Central Intelligence in order to ensure that the appropriate balance and priority of requirements is achieved each day.**

- **The Secretary of Defense and Director of Central Intelligence should undertake an educational effort to ensure that Intelligence Community members and customers are properly trained in the requirements process, the cost of NRO support, and in their responsibilities in requesting NRO support.**

## Defense Space Reconnaissance Program (DSRP)

In the 1970s, the NRO's satellite collection capabilities and products began to be made more broadly available to the military. The expanded use of this data spawned the creation in 1981 of the Defense Support Project Office (DSPO) within the NRO. DoD established the Defense Reconnaissance Support Program (DRSP), under the management of the DSPO, and used it as a mechanism to provide additional funds from DoD to the NRO for systems development and operations that directly contributed to the support of tactical military users. Congress later authorized and appropriated specific funding to the DSPO within the DRSP budget to ensure that military warfighting requirements were addressed in the design and operation of NRO satellites.

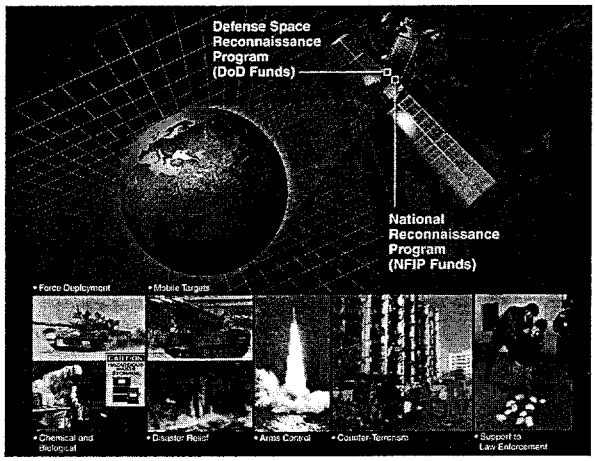
***Pressures on the National Foreign Intelligence Program to address requirements that are uniquely military in nature are increasing and there is no longer a DoD budget program element to offset the rising cost to the NRO of meeting those requirements.***

The DRSP funds were generally used to meet unique military requirements for NRO satellite reconnaissance systems. These funds, on the order of several hundreds of millions of dollars, paid for additional satellites or military-specific systems. The DRSP budget was managed by the DSPO. The NRO Director also

served as the Director of the DSPO, thus ensuring that NRO program offices were responsive to the needs and requirements of both the Intelligence Community and the military departments.

Between 1981 and 1994, the NRO was authorized and appropriated annual funds from both the National Reconnaissance Program (NRP) element of the National Foreign Intelligence Program budget (NFIP) and the DRSP element of the Tactical Intelligence and Related Activities (TIARA) program budget. The NRP was used to pay for Intelligence Community requirements for development, operation and maintenance of NRO satellite reconnaissance systems, as well as NRO innovative technology activities. Supplemental funding for NRO efforts to satisfy military requirements was provided from DoD's DRSP budget.

**NRO Satellite Funding: 1981-94**




A 1994 agreement between the Deputy Secretary of Defense and the DCI transferred all of the satellite acquisition and infrastructure funding into the NRP. As a result, DRSP funding was reduced to tens of millions of dollars per year to be spent on helping military customers learn how to use collection and processing

systems effectively. The DRSP was renamed the Defense Space Reconnaissance Program (DSRP).

The effect of this 1994 agreement is that NRO efforts to support both Intelligence Community and military requirements are now paid for out of the NRP budget. In 1999, Congress directed the abolition of the DSPO and its functions were transferred to the NRO Deputy Director for Military Support.

As explained earlier, military requirements have continued to grow and contention for NRO satellite resources has increased. The number of extended U.S. military commitments and other U.S. interests around the globe that require continuing support is also stressing the capacity of NRO reconnaissance systems to detect critical indications and warnings of potentially threatening events.

Pressures are increasing, as a result, on the NRP and NFIP to address these requirements—even those uniquely military in nature. Yet there is no longer a DoD budget program element to offset the rising cost of meeting those requirements as there was when the DRSP competed against other DoD budget requirements to provide the needed funds.

Experience since 1994 suggests that adaptations of NRO systems for tactical purposes have met with increasing difficulty competing within the NFIP budget and that NRP spending on tactical needs is seen as a drain on the Intelligence Community and the NFIP. Military influence toward improving the tactical support capabilities of future satellite systems is limited because the Intelligence Community believes that many of the proposed improvements are DoD-unique and should not be paid for by the NFIP.

The Commission believes it is time to reinstitute DSRP funding for NRO programs. Besides easing the budget pressures, this would help sensitize military users to the costs associated with

added requirements and reduce the current tendency to view NRO products as a "free" commodity with no value attached and no cost-benefit measurement against competing demands.

The Commission supports the language in the report accompanying the Fiscal Year 2001 DoD Authorization Act that parallels the findings of the Commission. That report states that the DSRP has served an important role in providing direct interactions among the NRO and operational military commanders and other elements of DoD. It also states that the Secretary of Defense needs to evaluate the overall role of the NRO in supporting tactical military forces.

This evaluation is to include a review of, among other things, whether a revitalized DSRP would be the best mechanism for giving the Unified Commands a role in determining future space intelligence and reconnaissance capability requirements and raising the visibility of space reconnaissance matters within the DoD program planning and resource allocation process. The evaluation also is to include the role of a revitalized DSRP in funding NRO system developments to satisfy unique military requirements. The Authorization Report directs the Secretary of Defense to provide the congressional defense and intelligence committees a report by May 1, 2001 on his assessment and recommendations in these regards.

## Recommendation

- **The Secretary of Defense, in consultation with the Director of Central Intelligence, should re-establish the Defense Space Reconnaissance Program as a means of funding tactical military requirements for NRO systems and architectures.**

## Increased Resource and Budgetary Flexibility

The provisions of the 1997 Intelligence Authorization Act were intended, among other things, to enhance the authority of the DCI in regard to the annual NFIP budget. Thus, the DCI is required to approve any reprogramming of NFIP funds by any Intelligence Community element.

***The DCI should have greater latitude to redirect funds among intelligence collection areas and agencies in order to respond most effectively to the specific types of program issues that arise at the NRO.***

The DCI was also given authority to transfer funds or personnel within the NFIP budget to meet unforeseen and higher priority intelligence requirements. However, that authority is conditional on the agreement of the "Secretary or head of the department which contains the affected element or elements...." This requirement for agreement could negate the DCI's ability to move personnel and financial resources around the Intelligence Community, including to or from the NRO, to deal with unexpected contingencies and technological or other developments.

In this respect, the Commission notes that Section 105 of the FY 2001 Intelligence Authorization Act has ameliorated this situation somewhat in favor of the DCI. That section provides that only the Secretary or head of an agency has the authority to object to a transfer of funds within the NFIP and that such objections must be in writing. The Act further provides that, within the Department of Defense only, the Deputy Secretary of Defense may be delegated the authority to object for the Secretary and that the Deputy Director of Central Intelligence for Community Management may be delegated the DCI's authority to transfer funds.

### Recommendations

- The Director of Central Intelligence should be granted greater latitude to redirect funds among intelligence collection activities and agencies in order to respond most effectively to the specific types of issues that arise in NRO programs.
- Transfers greater than $10 million would continue to require the concurrence of the affected Secretary or agency head. This could be coupled with a provision to allow a Secretary or agency head who has objections to such transfers the opportunity to appeal the Director of Central Intelligence's decision to the President.
- The requirement that such transfers be made known to the appropriate congressional committees should not be altered.

## NRO Technical Expertise

The NRO's success is directly attributable to the high quality and creativity of the DoD, CIA and contractor workforce that has been dedicated to supporting the NRO. The overwhelming majority of the U.S. Government personnel who work at the NRO are employees of the CIA or DoD who have been assigned to the NRO for some portion of their careers and who have the technical expertise needed for complex NRO programs. A substantial number of these are active duty military personnel.

*The Commission believes there is a compelling need for an NRO career path and assignment policy that provides the opportunity for highly trained engineers and acquisition and operations specialists to be assigned to and progress through a broad range of NRO positions.*

Until recently, many of these personnel served the majority of their careers with the NRO, transferring among its acquisition, development, launch, and operating elements. Some never returned to their parent organization for any appreciable length of time. This allowed a highly skilled cadre of personnel to advance within the management structure of the NRO, gaining experience at various levels of its technical, financial and acquisition programs along the way. Promising young military and CIA officers were groomed to become the NRO program managers of the future. Long tenure and accomplishment at the NRO were valued by their parent organizations and these personnel were promoted along with, and sometimes ahead of, their peers who followed more traditional career paths within their agency or military service.

With the transition from separate programs to a functionally-based organization, there is no longer a unique career path for many of the personnel assigned to the NRO. For example, in the past when there were independent Air Force, CIA and Navy elements called Programs A, B, C, and D, Air Force personnel in Program A were assigned to the Secretary of the Air Force Office of Special Programs (SAFSP). They were hand-selected for assignment to the NRO and their careers were managed by SAFSP. This Air Force element was directly tied to the strategic mission of the Air Force to monitor the Soviet Union's nuclear forces. As a result, there were clear incentives for the Air Force to contribute to the NRO mission, promote Air Force identity and mentor and care for its people efficiently.

Likewise, Program B, which was staffed by personnel from the CIA's Directorate of Science and Technology (DS&T), had its own unique identity and career path within the DS&T Office of Development & Engineering. Those personnel also were hand-selected for a career within the NRO. They were tied directly to the CIA's strategic intelligence mission and the requirements generated by

the DS&T and had very clear objectives and career paths to become managers of the NRO's Program B systems.

New personnel assignment practices adopted by the parent organizations have had the effect of limiting the tenure of personnel assignments to the NRO. Because rotational assignments back to these organizations appear to be a requirement for career advancement beyond a certain grade, there is a resulting concern that the NRO could lose its ability to sustain the cadre of highly-skilled and experienced personnel it needs to guarantee mission success. In some cases, this cadre is prevented from gaining equivalent broad space-related experience during the rotational assignments. While it is understandable that a parent organization may want to exploit the special skills their personnel develop in the NRO, the cost to NRO space reconnaissance programs is likely to be greater than the value of broader experience to these other organizations.

In fact, serving too much time supporting the development and acquisition of our nation's most sensitive and unique space reconnaissance systems is often seen as detrimental to one's career. Also, there are no longer any separate military service elements (Air Force, Navy, and Army) within the NRO to monitor personnel assignments or career progression.

The Commission believes there is a compelling need for an NRO career path and assignment policy that allows highly trained engineers and acquisition and operations specialists to be assigned to and progress through a broad range of NRO positions. In this respect, the Commission notes that Section 404 of the FY 2001 Intelligence Authorization Act enables the DCI to detail CIA personnel to the NRO indefinitely on a reimbursable basis and to hire personnel for purposes of detailing them to the NRO.

The Commission recognizes that there may be assignment possibilities within other U.S. Government space or technical programs that could contribute to the professional development of these personnel. However, the technical complexity of NRO systems is unique, and mission success requires the continuity of a dedicated cadre of personnel skilled in the development, acquisition and operation of those systems.

### Recommendation

- **The Secretary of Defense and the Director of Central Intelligence should jointly establish NRO career paths to ensure that a highly skilled and experienced NRO workforce is continued and sustained.**

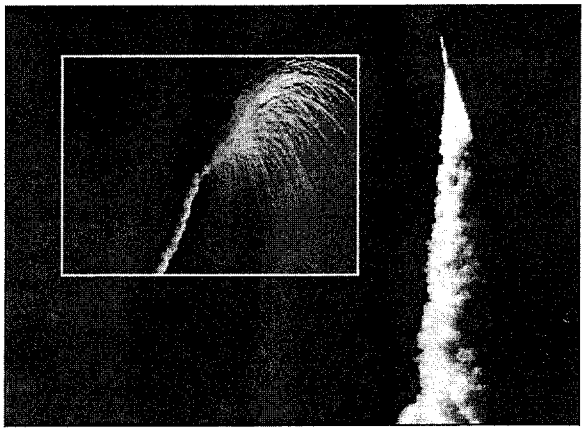
## Increased Launch Program Risks

The Commission believes the current status of the NRO satellite and launch program dramatically highlights the need for active participation and leadership by the Secretary of Defense and DCI in managing the nation's space reconnaissance program. Because the NRO is managed jointly by the Secretary of Defense and DCI, it is essential that its operating responsibilities be clear and allow for sufficient review of program decisions by other affected agencies. Such reviews are consistent with the responsibilities of the Secretary of Defense and DCI to assure global access through space reconnaissance. Without such senior involvement, there is a real

***There appears to be no national strategy or effective and engaged National Security Council-level mechanism to provide the guidance and oversight needed to ensure a robust national space reconnaissance architecture. This has led to a situation in which failures in existing or new spacecraft and launch vehicles could result in significant gaps in the intelligence coverage that is available from NRO systems.***

risk that NRO program decisions will be made without a full appreciation of their consequences for overall national security.

The Commission is alarmed that one particular potential vulnerability in the NRO's programs has arisen that might have been avoided with proper foresight, leadership and review at the national decision-making level. The NRO is now on a path that leads toward a future period of unprecedented risks inherent in concurrent satellite and launch vehicle development and transition. It is developing *new* spacecraft that will be launched by *new* launch vehicles. Today, the fragility of the satellite and launch architectures offers no margins for error.



The explosion of a Titan IVA in August 1999 was caused by wiring defects. Titan IV quality problems were linked to the overemphasis on cost-cutting and the loss of experienced personnel.

Historically, spacecraft and launch vehicle development programs have failed to meet their original estimated delivery dates. In addition, the initial spacecraft and launch vehicles that emerge from new development programs have often experienced failures because of design flaws that were not discovered prior to their first flights. In the past, such delays and failures could usually be mitigated because the NRO either had robust satellite capabilities in

orbit, or had satellites or launch vehicles in production that could be accelerated to fill any gaps.

Today, however, sufficient NRO contingency capability does not exist and has not been budgeted. The number of current launch vehicles that remain available to the NRO until the U.S. Government-sponsored Evolved Expendable Launch Vehicle (EELV) program is completed is strictly limited to those necessary for planned NRO launches. In addition, the NRO has adopted more optimistic assumptions for the operational lifetimes for its current satellite systems than it has in the past.

The NRO believed that a significant number of commercial and other U.S. Government launches would demonstrate the reliability of EELV launch vehicles long before the NRO would be required to launch its newly developed satellites on them. This has not happened and current launch projections indicate NRO satellites are scheduled to fly on very early EELV launch vehicles.

In addition, the EELV and some NRO satellites under development are now using an acquisition reform management approach that may cut costs, but has proven to be controversial since it involves less participation by skilled U.S. Government and contract personnel in overseeing the work of satellite and launch vehicle manufacturers. NASA has acknowledged that some of its recent satellite problems directly correlate with programs involving less Government participation and use of acquisition reform techniques. The application of these new acquisition reform techniques and commercial practices to the EELV, and to some NRO programs, may add additional risks and uncertainty relative to technical, schedule and cost success.

The Commission is vitally concerned about the implications of this unprecedented period of concurrent satellite and launch vehicle development and transition that could have major impacts on

the U.S. space reconnaissance program. The decisions that have brought about this situation have been based upon resource constraints and NRO assessments. The decisions have not been adequately reviewed at the highest levels of the U.S. Government to assess their overall implication for the national security posture.

The Commission notes the painful lesson of the 1980s that grew out of the decision to launch all NRO satellites from the Space Shuttle. Following the *Challenger* disaster and the suspension of Space Shuttle flights, the NRO was forced to reconfigure its satellites for other launch vehicles. This cost billions of dollars and placed U.S. national security at risk during the period when replacement satellites could not have been launched if circumstances had so required.

There appears to be no national strategy or effective and engaged National Security Council-level mechanism to provide the guidance and oversight needed to ensure a robust national space reconnaissance architecture. This has led to a situation in which failures in existing or new spacecraft and launch vehicles could result in significant gaps in the intelligence coverage that is available from NRO systems.

## Recommendations

- **The NRO Director, with the support of the Air Force Materiel Command and Space and Missile Systems Center, should develop a contingency plan for each NRO program or set of programs. These plans should describe risks, contingency options and failure mitigation plans to minimize satellite system problems that might result from satellite or launch vehicle failures.**
- **The Secretary of Defense and Director of Central Intelligence should establish independent teams to conduct**

**pre-launch assessments of non-traditional areas of risk. These teams should be made up of recognized space launch experts and be granted whatever special authorities and accesses are required to perform their duties.**

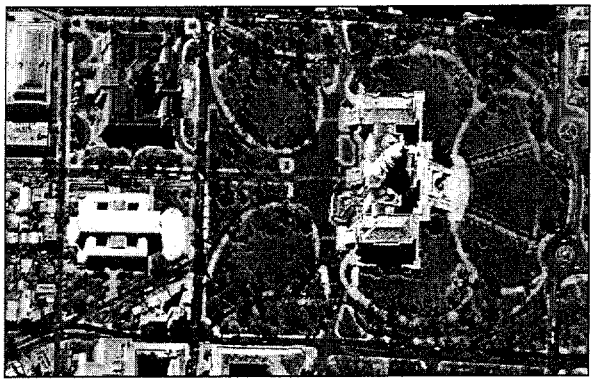
- **The Commission to Assess United States National Security Space Management and Organization should evaluate the need for an improved organization structure to provide launch capability and operations for the deployment and replenishment of NRO and DoD satellites.**

## Commercial Satellite Imagery

**Background.** The NRO's future could be affected significantly by the degree to which it is able to exploit the ongoing development of a competitive commercial space imagery industry. That industry is in an embryonic stage in the United States and abroad, but the technology available to it is already mature. According to a recent classified U.S. Government study, the U.S. Government could satisfy a substantial portion of its national security-related imagery requirements by purchasing services from the U.S. commercial imagery industry.

*The U.S. Government could satisfy a substantial portion of its national security-related imagery requirements by purchasing services from the U.S. commercial imagery industry.*

The National Space Policy promulgated by Presidential Decision Directive-49 in September 1996 includes Commercial Space Guidelines to promote the development of a competitive U.S. commercial space imagery industry. The stated goal of the Policy is to enhance U.S. commercial space activities while at the same time protecting U.S. national security and foreign policy interests.



One-meter pan-sharpened color image of the U.S. Capitol, collected by Space Imaging's Iknoos satellite. This image demonstrates current, first-generation commercial space imagery capability.

The Policy further directs U.S. Government agencies to purchase "commercially available" space goods and services to the fullest extent "feasible" and not to conduct activities with commercial applications that deter commercial space activities, except for reasons of national security or public safety.

The 1996 Space Policy also explains that the U.S. Government will not provide direct federal subsidies to the commercial space industry. It should, however, facilitate "stable and predictable" U.S. commercial sector access to appropriate Government space-related hardware, facilities and data to stimulate private sector investment in and operation of space assets.

Over the last several years, NRO and NIMA officials have considered the means by which the commercial imagery industry could complement U.S. Government collection, analysis and dissemination capabilities to support Government needs. Substantial Government purchases of commercial imagery were promised. As a result, there were high expectations in the private sector.

However, such purchases have been relatively insignificant. Questions have been raised about the effectiveness of the Government's plan for buying imagery products and services.

Criticism has been directed at the process for transferring Government technologies that will be needed if the U.S. commercial imagery industry is to be successful. How these issues are resolved will have a great impact on the long-term viability of the industry and its ability to generate products and services of use to the U.S. Government.

**Space Imagery as a "Commodity."** The basic technology for collecting and processing high-resolution images from space has become available to an increasing number of nations. Ally or adversary, all nations that have developed or are developing a space-based imagery capability have expressed an intention to serve civil sector needs and, in most cases, to offer the images to the commercial market.

**Government Acquisition of Commercial Imagery.** Over time, the Government has clearly tended toward greater dependence on private sector sources for many of its needs. This has included an extraordinary range of technologies, components, subsystems, and services, as well as integrated systems ranging from microelectronics to space launch vehicles.

A decision to rely on commercial imagery to supply some portion of U.S. Government imagery needs necessarily raises questions about whether the private sector can be relied on to provide services of sufficient quality and timeliness. Further questions relate to how best to structure Government procurement of commercial imagery.

Of no less importance is the question of whether domestic or international sale of high-resolution images will adversely affect the interests of the U.S. Government. These interests include ensuring the security of U.S. and allied military deployments and operations and preventing U.S. adversaries from acquiring

information that will aid them in conducting denial and deception operations.

The U.S. commercial imagery industry has made substantial investments in current first-generation space imaging systems and it proposes to make even larger investments in planned second-generation systems. It is also making additional investments to improve the quality, accuracy and timeliness of these systems. Many of these improvements respond to earlier U.S. Government assessments that were skeptical of the utility of commercial imaging systems to the Government.

The commercial imaging industry has received mixed signals from the U.S. Government. While the NRO and NIMA have publicly expressed support for the commercial imaging industry, only minimal Commercial Imagery Program funding has been made available to the industry and future funding has not been added.

The lack of U.S. Government commitment to acquire commercial imagery is further demonstrated by managerial problems that have emerged in NIMA's Commercial Imagery Program. There is no continuity in the Program and the program manager has been changed frequently.

The Commission supports Government purchases of one meter and one-half meter resolution commercial imagery, which can meet a large percentage of U.S. Government imagery requirements. Because of the lack of demonstrated commitment, the Commission believes there is a need for an overall assessment—independent of the NRO—of the utility of commercial technologies to supplement traditional NRO missions.

Assuming that imagery of the required resolution and timeliness is available from both the NRO and the commercial imagery industry, under present procedures NIMA will have a natural

preference for NRO imagery over commercial imagery. NIMA does not have to purchase NRO imagery; it is "free."

To deal with similar tendencies in determining whether to use military or commercial airlift capabilities, DoD has created an industrially funded account. The manager of this account determines for the customer whether military or civilian airlift best meets the customer's needs within the budget resources available. Thus, the use of a C-17 aircraft for a routine peacetime cargo flight to a modern European airport is unlikely since a commercial aircraft could perform the same task far more cheaply. The military aircraft would be chosen when circumstances (e.g., unprepared runways) justify doing so.

With regard to U.S. Government imagery requirements, a number of critical national security interests can only be met by Government systems. However, a large number of targets can be covered by commercial capabilities. Through an approach to imagery analogous to DoD's military/civilian airlift practice, Government systems would be focused on targets where their unique capabilities in resolution and revisit times are important, while commercial systems would be used to provide processed "commodity" images.

In the long term, such a division of labor between the public and private sectors will allow the commercial sector to develop without a U.S. Government subsidy. A predictable market will be created, and private sector investors will be able to establish an infrastructure to meet predictable U.S. Government needs. Current Government acquisition practices for commercial imagery have helped create an unpredictable market. This substantially increases the risk to investors and diminishes the ability of the commercial imagery sector to meet U.S. Government needs.

**Government Licensing of Commercial Imagery Systems.** In March 1994, President Clinton signed Presidential Decision

Directive (PDD)-23 establishing a policy permitting U.S. firms to obtain licenses to market imagery products and systems commercially. Its stated goal was to enhance U.S. competitiveness in space imagery capabilities, while protecting U.S. national security and foreign policy interests.

Delays in the U.S. Government licensing approval process, along with several recent failures in commercial satellite ventures and the mixed signals on purchases by the U.S. Government described earlier, are causing investors to reevaluate their financial support for the U.S. space imagery industry. This financial environment, coupled with the decline in the scale and pace of U.S. Government satellite programs, is weakening the portion of the U.S. industrial base that provides the foundation for the NRO's space programs. The skilled workforce on which both the NRO and the commercial imagery industry rely has been eroding, while research and development investment that leads to the technological change necessary for the United States to maintain its global dominance in space has been falling.

In some cases, particularly those involving "first time" applications for licensing of newer technologies, U.S. commercial imagery firms report having faced delays of more than 30 months in getting responses to licensing applications. This is far longer than even the processing time now needed for an export license for defense products.

Planning, building and placing a commercial satellite in orbit requires approximately three to five years to meet required launch and replenishment schedules. In the private sector, strict adherence to these schedules is essential to persuade customers and investors that services will be provided as advertised and that earnings projections will be met. Obviously, a wait of three years for the needed license approvals is not consistent with a commercial space imagery initiative on a five-year development schedule.

The way in which U.S. policy on licensing of commercial imagery initiatives is being implemented is likely to have an adverse effect on the long-term security, commercial and industrial interests of the United States. The present impediments to acquisition and development of commercial imagery will diminish the industrial base available to support U.S. Government space-based imagery needs.

Meanwhile, foreign competitors in the commercial imagery industry enjoy relative freedom from U.S. export and licensing controls. These foreign firms could dominate the global remote sensing market in the 2005 timeframe if their U.S. counterparts are stymied by an ineffective national strategy and a U.S. Government bureaucracy that cannot keep pace with the global marketplace. The United States is in danger of losing an opportunity to develop this market, while stimulating foreign investment in it.

U.S. Defense and Intelligence Community officials are justly concerned that such high-resolution imagery could give adversaries of the United States the ability to monitor U.S. intentions and capabilities, particularly during future crises involving tactical military operations. While this risk certainly exists, current law allows the United States to exercise "shutter control" over U.S. commercial space imagery vendors and systems where necessary for national security or foreign policy reasons. This authority alleviates the risk to some extent.

More significantly, however, impeding the access of U.S. industry to this market is more likely to increase, rather than diminish, this risk by creating incentives for investors to create a capability outside the United States. Several countries are likely to possess high-resolution imagery satellites by 2005. As a result, whether or not U.S. companies are granted licenses to proceed with such systems, it appears that high-resolution imagery eventually will be available on the open market to anyone who can afford the price.

**Report of the National Imagery and Mapping Agency Commission.** As the Commission was in the final stages of preparing this Report, the Commission to Review the National Imagery and Mapping Agency (NIMA) made its report available. The Commission is pleased to note that the findings and recommendations of both reports are in close agreement in the area of commercial imagery. The Commission also joins the NIMA Commission in applauding the National Security Council's recent decision to approve two license applications for a one-half meter resolution commercial imagery satellite.

## Recommendations

- **A clear national strategy that takes full advantage of the capabilities of the U.S. commercial satellite imagery industry must be developed by the President, Secretary of Defense and Director of Central Intelligence.**
- **The strategy must contain a realistic execution plan—with timelines, a commitment of the necessary resources and sound estimates of future funding levels.**
- **The strategy also should remove the current fiscal disincentives that discourage use of commercial imagery when it is technically sufficient to meet user needs.**
- **The NRO should work with NIMA to develop a new acquisition model for commercial imagery that will help create the predictable market necessary for the industry to become a reliable supplier to the U.S. Government. The acquisition model should include provisions for the pricing of imagery to the user from either the commercial or Government sources that reflect the cost of acquiring such images to the U.S. Government.**

- **The Secretary of Defense and the Director of Central Intelligence should develop a strategy that recognizes the threat posed to the United States by the likely availability of commercial space imagery to opponents of the United States.**

## NRO Airborne Reconnaissance Responsibilities

Strategic airborne reconnaissance requires serious attention. The earliest NRO reconnaissance successes included strategic airborne, as well as space, platforms. Examples include the U-2 and SR-71 aircraft. Although the NRO still has responsibility for such systems according to a 1964 DoD Directive still in effect, the Commission is unaware that any strategic airborne reconnaissance systems are being considered for further development by the NRO.

*Too often, space reconnaissance and strategic airborne reconnaissance are viewed as mutually exclusive capabilities.*

Too often, space reconnaissance and strategic airborne reconnaissance are viewed as mutually exclusive capabilities. In fact, they are quite complementary and contribute unique support to a tiered concept of intelligence collection.

Space-based reconnaissance can monitor the entire globe in an unobtrusive, non-threatening way. However, satellites cannot supply long-term, uninterrupted, focused, multi-intelligence coverage of a limited area of interest. Airborne reconnaissance can supply excellent coverage of limited areas, but can be threatened by hostile action and affected by over-flight restrictions.

Aircraft payloads can be changed for specific missions and updated as technology improves. Satellite payloads are fixed in design early and flown for the life of the vehicle with limited ability to

update functions. If a tiered collection management scheme were used to combine satellite "tip off" and "deep look" capabilities with aircraft flexibility and dwell capabilities, national strategic and tactical requirements would be well served.

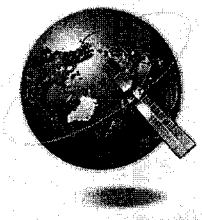
In the early 1990's, the Defense Airborne Reconnaissance Office (DARO) was established. This was intended in part to provide a comprehensive approach to all strategic and tactical airborne reconnaissance platforms. When DARO was abolished, responsibilities for the development of airborne reconnaissance systems passed to the military services. The Intelligence Community therefore has to depend on the military services for intelligence from airborne platforms.

Very high altitude, long range airborne reconnaissance systems provide strategic value and accessibility. These systems merit continued examination by the NRO in light of the features they share in common with space systems.

To achieve and maintain a proper balance between space-based and airborne reconnaissance, the Commission believes the NRO needs to restore its interest in airborne platforms and participate in engineering studies to select the proper platform for the required mission.

## Recommendation

- **The NRO should participate jointly with other agencies and departments in strategic airborne reconnaissance development. Specifically, the NRO should supply system engineering capabilities and transfer space system technologies to airborne applications.**



# APPENDIX A
# LIST OF RECOMMENDATIONS

## Overall Finding and Conclusion

- The Commission concludes that the National Reconnaissance Office demands the personal attention of the President of the United States, the Secretary of Defense and the Director of Central Intelligence. It must remain a strong, separate activity, with a focus on innovation, within the Intelligence Community and the Department of Defense. Failure to understand and support the indispensable nature of the NRO as the source of innovative new space-based intelligence collection systems will result in significant intelligence failures. These failures will have a direct influence on strategic choices facing the nation and will strongly affect the ability of U.S. military commanders to win decisively on the battlefield.

### NRO Mission

- The Secretary of Defense and Director of Central Intelligence must direct that the NRO mission be updated and focused as a first priority on the development, acquisition and operation of highly advanced technology for space reconnaissance systems and supporting space-related intelligence activities, in accordance with current law.
- The Secretary of Defense and Director of Central Intelligence should determine the proper roles for the NRO,

National Security Agency, National Imagery and Mapping Agency, and Central MASINT Organization in Tasking, Processing, Exploitation, and Dissemination activities.

## NRO Technological Innovation

- The President of the United States, the Secretary of Defense and the Director of Central Intelligence must pay close attention to the level of funding and support for the NRO Director's research, development and acquisition effort.

- The Secretary of Defense and Director of Central Intelligence should ensure common understanding of the NRO's current and future capabilities and the application of its technology to satisfy the needs of its mission partners and customers.

## Office of Space Reconnaissance

- The Secretary of Defense and the Director of Central Intelligence should establish a new Office of Space Reconnaissance under the direction of the Director of the NRO. The Office should have special acquisition authorities, be staffed by experienced military and CIA personnel, have a budget separate from other agencies and activities within the National Foreign Intelligence Program, be protected by a special security compartment, and operate under the personal direction of the President, Secretary of Defense and Director of Central Intelligence.

## The Secretary of Defense—Director of Central Intelligence Relationship

- The President must take direct responsibility to ensure that the Secretary of Defense and Director of Central Intelligence relationship regarding the management of the NRO is functioning effectively.
- The President should direct the development of a contemporary statement defining the relationship between the Secretary of Defense and Director of Central Intelligence with regard to their management of the NRO.

## Balanced Response to Customer Demands

- The Secretary of Defense and the Director of Central Intelligence must work closely together to ensure that proper attention is focused on achieving the appropriate balance between strategic and tactical requirements for NRO systems, present and future.
- The Presidential Decision Directive (PDD-35) that establishes priorities for intelligence collection should be reviewed to determine whether it has been properly applied and should remain in effect or be revised.
- The imagery intelligence and signals intelligence requirements committees should be returned to the Director of Central Intelligence in order to ensure that the appropriate balance and priority of requirements is achieved each day.
- The Secretary of Defense and Director of Central Intelligence should undertake an educational effort to ensure that Intelligence Community members and customers are properly trained in the requirements process, the cost of NRO support, and in their responsibilities in requesting NRO support.

## Defense Space Reconnaissance Program (DSRP)

- The Secretary of Defense, in consultation with the Director of Central Intelligence, should re-establish the Defense Space Reconnaissance Program as a means of funding tactical military requirements for NRO systems and architectures.

## Increased Resource and Budgetary Flexibility

- The Director of Central Intelligence should be granted greater latitude to redirect funds among intelligence collection activities and agencies in order to respond most effectively to the specific types of issues that arise in NRO programs.
- Transfers greater than $10 million would continue to require the concurrence of the affected Secretary or agency head. This could be coupled with a provision to allow a Secretary or agency head who has objections to such transfers the opportunity to appeal the Director of Central Intelligence's decision to the President.
- The requirement that such transfers be made known to the appropriate congressional committees should not be altered.

## NRO Technical Expertise

- The Secretary of Defense and the Director of Central Intelligence should jointly establish NRO career paths to ensure that a highly skilled and experienced NRO workforce is continued and sustained.

## Increased Launch Program Risks

- The NRO Director, with the support of the Air Force Materiel Command and Space and Missile Systems Center, should develop a contingency plan for each NRO program or set of programs. These plans should describe risks, contingency options and failure mitigation plans to minimize satellite system problems that might result from satellite or launch vehicle failures.
- The Secretary of Defense and Director of Central Intelligence should establish independent teams to conduct pre-launch assessments of non-traditional areas of risk. These teams should be made up of recognized space launch experts and be granted whatever special authorities and accesses are required to perform their duties.
- The Commission to Assess United States National Security Space Management and Organization should evaluate the need for an improved organization structure to provide launch capability and operations for the deployment and replenishment of NRO and DoD satellites.

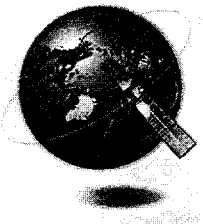
## Commercial Satellite Imagery

- A clear national strategy that takes full advantage of the capabilities of the U.S. commercial satellite imagery industry must be developed by the President, Secretary of Defense and Director of Central Intelligence.
- The strategy must contain a realistic execution plan—with timelines, a commitment of the necessary resources and sound estimates of future funding levels.
- The strategy also should remove the current fiscal disincentives that discourage use of commercial imagery when it is technically sufficient to meet user needs.

- The NRO should work with NIMA to develop a new acquisition model for commercial imagery that will help create the predictable market necessary for the industry to become a reliable supplier to the U.S. Government. The acquisition model should include provisions for the pricing of imagery to the user from either the commercial or Government sources that reflect the cost of acquiring such images to the U.S. Government.
- The Secretary of Defense and the Director of Central Intelligence should develop a strategy that recognizes the threat posed to the United States by the likely availability of commercial space imagery to opponents of the United States.

## NRO Airborne Reconnaissance Responsibilities

- The NRO should participate jointly with other agencies and departments in strategic airborne reconnaissance development. Specifically, the NRO should supply system engineering capabilities and transfer space system technologies to airborne applications.



# APPENDIX B
# LIST OF WITNESSES

The following is a list of witnesses who appeared before the Commission. All hearings were held in Washington, D.C. Affiliations listed are as of the time of the appearance.

| | |
|---|---|
| **Charles E. Allen** | Assistant Director of Central Intelligence for Collection |
| **James L. Armitage** | Vice President, Baltimore Operations, Northrop Grumman Corporation |
| **John T. Baran** | Vice President, Business Development & Strategic Planning, BAE Systems |
| **Jeffrey P. Bialos** | Deputy Under Secretary of Defense for Industrial Affairs |
| **VADM Herbert A. Browne, USN** | Deputy Commander-in-Chief, United States Space Command |
| **Joseph R. Cabrera** | Manager, Space Systems, The Harris Corporation |
| **Gene Colabatistto** | President, SPOT Image Corporation |
| **John R. Copple** | Chairman and Chief Executive Officer, Space Imaging |
| **Kenneth C. Dahlberg** | Executive Vice President, Business Development, Raytheon International |
| **Joseph K. Dodd** | Vice President, Government Programs, Orbimage |
| **Frederick J. Doyle** | Director, Systems Engineering & Integration, Space Imaging |
| **Robert H. Dumais** | Executive Vice President, Special Programs, Lockheed Martin Corporation |
| **Margaret Evans** | Former official, Office of Management & Budget |

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|---|---|
| **James W. Evatt** | Executive Vice President, Space & Communications, The Boeing Company |
| **VADM David E. Frost, USN (Ret.)** | Former Deputy Commander-in-Chief, United States Space Command |
| **John C. Gannon** | Assistant Director of Central Intelligence for Analysis and Production; Chairman, National Intelligence Council |
| **Dr. Robert Gates** | Former Director of Central Intelligence |
| **Keith R. Hall** | Director, National Reconnaissance Office & Assistant Secretary of the Air Force for Space |
| **LtGen Michael V. Hayden, USAF** | Director, National Security Agency |
| **Leo Hazlewood** | Former Deputy Director, National Imagery and Mapping Agency |
| **Dr. Terry W. Heil** | Vice President, Raytheon Company |
| **Joanne O. Isham** | Deputy Director for Science & Technology, Central Intelligence Agency |
| **ADM David E. Jeremiah, USN (Ret.)** | Former Vice Chairman, Joint Chiefs of Staff |
| **Dr. Paul Kaminski** | Former Under Secretary of Defense for Acquisition and Technology |
| **David A. Kier** | Deputy Director, National Reconnaissance Office & Principal Deputy Assistant Secretary the Air Force for Space |
| **LTG James C. King, USA** | Director, National Imagery and Mapping Agency |
| **Ken K. Kobayaski** | Vice President & General Manager, National Security Programs, Hughes Space & Communications Company |

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|---|---|
| **Tig H. Krekel** | President & Chief Executive Officer, Hughes Space & Communications Company |
| **MajGen Nathan J. Lindsay, USAF (Ret.)** | Former Director, Secretary of the Air Force Special Program Office & Former Director, Program A, National Reconnaissance Office |
| **James Manchisi** | Vice President, Commercial and Government Systems, Eastman Kodak Company |
| **Col James T. Mannen, USAF (Ret.)** | Former Director, Imagery Intelligence Directorate, National Reconnaissance Office |
| **Carl A. Marchetto** | President, Commercial and Government Systems & Vice President Eastman Kodak Company |
| **John E. McLaughin** | Deputy Director for Intelligence, Central Intelligence Agency |
| **MajGen Howard J. Mitchell, USAF** | Director, National Security Space Architect |
| **Arthur L. Money** | Assistant Secretary of Defense for Command, Control, Communications and Intelligence |
| **Gen Thomas S. Moorman, Jr., USAF (Ret.)** | Former Vice Chief of Staff, United States Air Force & Vice President, Government Sector, Booz-Allen & Hamilton |
| **Joseph Movizzo** | Former General Manager, IBM Global Services Consulting Group |
| **Gen Richard B. Myers, USAF** | Vice Chairman, Joint Chiefs of Staff |
| **LTG William E. Odom, USA (Ret.)** | Former Director, National Security Agency |

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| **Dr. William Perry** | Former Secretary of Defense |
| **James A. Proctor** | Vice President & General Manager, Government Communications Systems, The Harris Corporation |
| **Rodger C. Rawls** | Vice President, Government Relations, BAE Systems |
| **Roger F. Roberts** | Vice President & General Manager, Integrated Defense Systems, The Boeing Company |
| **James G. Roche** | Corporate Vice President & President, Electronic Sensors and Systems, Northrop Grumman Corporation |
| **Gilbert D. Rye** | President, Orbimage |
| **Walter Scott** | Chief Technical Officer, EarthWatch, Incorporated |
| **James M. Simon, Jr.** | Assistant Director of Central Intelligence for Administration |
| **Albert E. Smith** | Executive Vice President, Space Systems, Lockheed Martin Corporation |
| **Carol A. Staubach** | Director, Advanced Systems & Technology, National Reconnaissance Office |
| **ADM William O. Studeman, USN (Ret.)** | Deputy General Manager, Intelligence & Information Superiority, TRW Systems & Information Technology Group |
| **Dr. Edward G. Taylor** | Chief, Communications and Information Technology, Massachusetts Institute of Technology Lincoln Laboratories |
| **W. David Thompson** | Founder, President, & Chief Executive Officer, Spectrum Astro, Inc. |

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|---|---|
| **Col Vic Whitehead, USAF (Ret.)** | Former System Program Director, Expendable Launch Vehicles & former Vice President, Space Launch Systems, Lockheed Martin Astronautics |
| **Donald C. Winter** | Executive Vice President & General Manager, Systems & Information Technology Group, TRW |



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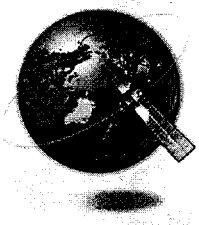

# APPENDIX C
# LIST OF INTERVIEWS

The following is a list of individuals who were interviewed by Commission Staff or members of the Commission. Affiliations listed reflect the individual's primary association as of the time of the interview. The list does not include numerous briefings provided to members of the Commission and Commission Staff by various U.S. Government officials.

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| **Paul Albright** | Imagery Intelligence Directorate, National Reconnaissance Office |
| **Edward "Pete" C. Aldridge** | President and Chief Executive Officer, The Aerospace Corporation |
| **Col Erik Anderson, USAF (Ret.)** | Senior Associate, Booz-Allen & Hamilton Inc. |
| **Chris Andrews** | Office of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence |
| **MajGen Brian Arnold** | Director of Space and Nuclear Deterrence, Office of the Assistant Secretary of the Air Force for Acquisition |
| **Gen Joseph W. Ashy, USAF (Ret.)** | Former Commander-in-Chief, United States Space Command |
| **Larry Axtell** | Office of Under Secretary of Defense for Acquisition, Technology, and Logistics |
| **Col Mike Baker, USAF** | Deputy Program Manager, Titan Programs, Air Force Space & Missiles Systems Center |
| **Dr. Marshall Banker** | President, BAE Systems |

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| **Dr. David A. Bearden** | Senior Project Engineer, The Aerospace Corporation |
| **Maj Betty Bennett, USAF** | Office of Space Launch, National Reconnaissance Office |
| **RADM Thomas Betterton, USN (Ret.)** | Former Director, Program C, National Reconnaissance Office |
| **Marc Berkowitz** | Director, Space Policy, Office of the Assistant Secretary of Defense for Command, Control, Communication, and Intelligence |
| **Dave Bradley** | Delta IV Mission Services, The Boeing Company |
| **Roy Bridges** | Director, Kennedy Space Center, National Aeronautics and Space Administration |
| **Joseph V. Broadwater, Jr.** | Corporate Operations Office, National Reconnaissance Office |
| **Bobby Bruckner** | Director, Expendable Launch Vehicles, Kennedy Space Center, National Aeronautics and Space Administration |
| **Jon H. Bryson** | Senior Vice President, National Systems Group, The Aerospace Corporation |
| **Laurence K. Burgess** | Associate Deputy Director for Military Support, National Reconnaissance Office |
| **David Burke** | Launch Systems Engineering and Operations, Hughes Space and Communications |
| **Steve Burrin** | Vice President, Space Program Operations, The Aerospace Corporation |
| **Roger Campbell** | Human Resources Management Group, National Reconnaissance Office |

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| **Dr. Stephen Cambone** | Staff Director, Commission to Assess the United States National Security Space Management and Organization |
| **Dr. Gregory H. Canavan** | Los Alamos National Laboratory |
| **Noel Clinger** | Imagery Intelligence Directorate, National Reconnaissance Office |
| **Brent Collins** | Program Executive Officer for Space, Office of the Assistant Secretary of the Air Force for Acquisition |
| **Dr. Robert E. Conger** | Vice President, MicroCosm, Incorporated |
| **Thomas W. Conroy** | Deputy Director for National Support, National Reconnaissance Office |
| **Col Charles Crain, USAF** | Program Manager, Titan Programs, Air Force Space & Missiles Systems Center |
| **BGen Tommy F. Crawford, USAF** | Deputy Director for Military Support, National Reconnaissance Office |
| **James P. Crumley, Jr.** | Vice President, Government Relations, ITT Industries |
| **John Cunningham** | System Program Director, National Polar Orbiting Environmental Satellite System, National Oceanic & Atmospheric Administration |
| **Brian Dailey** | Senior Vice President, Lockheed Martin Corporation |
| **John H. Darrah** | Former Chief Scientist, Air Force Space Command |
| **LtGen Roger DeKok, USAF** | Deputy Chief of Staff for Plans & Programs, Headquarters, United States Air Force |
| **Vincent W. Dennis** | Deputy Director, Resource Oversight and Management, National Reconnaissance Office |

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| **MajGen Robert S. Dickman, USAF** | Director, Corporate Operations Office, National Reconnaissance Office |
| **Linda Drake** | Principal Director, Evolved Expendable Launch Vehicles, The Aerospace Corporation |
| **Darleen Druyun** | Principal Deputy Assistant Secretary of the Air Force for Acquisition & Management |
| **Fred Dubay** | Imagery Intelligence Directorate, National Reconnaissance Office |
| **McClellan "Guy" A. DuBois** | Vice President, Imagery & Geospatial Systems, Business Development, Raytheon Corporation |
| **Dr. Bob Duffner** | Senior Scientist, Air Force Research Laboratory |
| **Jim Dunn** | Collection Resources and Evaluation Staff, Central Intelligence Agency |
| **Col Mike Dunn, USAF** | System Program Director, Launch Programs, Air Force Space & Missiles Systems Center |
| **Blaise Durante** | Deputy Assistant Secretary for Management Policy & Program Integration, Office of the Assistant Secretary of the Air Force for Acquisition |
| **Col Steve Duresky, USAF** | Vice Commander, 45th Space Wing, Air Force Space Command |
| **Lloyd Erickson** | Chief Executive Officer, Astrotech Corporation |
| **Gen Howell M. Estes III, USAF (Ret.)** | Former Commander-in-Chief, United States Space Command |
| **Bill Files** | Launch Vehicle Integration Lead, Future Imagery Architecture Program, The Boeing Company |
| **Don Finch** | Corporate Operations Office, National Reconnaissance Office |

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| **RADM Rand H. Fisher, USN** | Director, Communications Directorate, National Reconnaissance Office |
| **Dennis D. Fitzgerald** | Director, Signals Intelligence Directorate, National Reconnaissance Office |
| **Mike Gass** | Vice President, Atlas Program, Lockheed Martin Astronautics |
| **Gina Genton** | Deputy Executive Director, Central Intelligence Agency |
| **LtCol Tony Goins, USAF** | Commander, 3rd Space Launch Squadron, Air Force Space Command |
| **James Greaves** | Associate Director, Flight Programs and Projects, Goddard Space Flight Center, National Aeronautics and Space Administration |
| **William Grimes** | Director, BIG SAFARI Program, United States Air Force |
| **Col Arsenio Gumahad, USAF** | Deputy Director, Communications Directorate, National Reconnaissance Office |
| **Dr. Herb Gursky** | Superintendent, Space Science Division, Naval Research Laboratory |
| **R. Cargill Hall** | Historian, National Reconnaissance Office |
| **BGen Michael Hamel, USAF** | Director of Requirements, Air Force Space Command |
| **Patricia M. Hanback** | Inspector General, National Reconnaissance Office |
| **Jeffrey Harris** | President, Space Imaging |
| **Marsha Hart** | Deputy Chief, Defense Collection Group, Defense Intelligence Agency |
| **Richard Hartley** | Director, Cost Group, National Reconnaissance Office |
| **Jimmie D. Hill** | Former Deputy Director, National Reconnaissance Office |

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| **J. Evan Hineman** | Former Deputy Director for Science & Technology, Central Intelligence Agency, and Former Director, Program B, National Reconnaissance Office |
| **MajGen Robert Hinson, USAF** | Commander, 14th Air Force, Air Force Space Command |
| **Murray Hirschbein** | Assistant Chief Technologist, National Aeronautics and Space Administration |
| **Col Brown Howard, USAF** | Corporate Operations Office, National Reconnaissance Office |
| **William B. Huntington** | Chief, Defense Collection Group, Defense Intelligence Agency |
| **LtCol Jimmy Hyatt, USAF** | Commander, 2nd Space Launch Squadron, Air Force Space Command |
| **LtCol Nancy Inspruker, USAF** | Program Manager, Medium Launch Vehicles, Air Force Space & Missiles Systems Center |
| **Larry Jackson** | Special Projects, GOES Program Lead, Hughes Space and Communications |
| **Dana Johnson** | RAND Corporation |
| **Dr. Peter Jones** | Senior Scientist, Air Force Research Laboratory |
| **John Karas** | Vice President, Evolved Expendable Launch Vehicles, Lockheed Martin Astronautics |
| **Lance Killoran** | Signals Intelligence Directorate, National Reconnaissance Office |
| **Col Michael C. Kimberling, USAF** | Imagery Intelligence Directorate, National Reconnaissance Office |
| **Gil Klinger** | Director, Policy, National Reconnaissance Office |

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| **MajGen John Kulpa, USAF (Ret.)** | Former Launch Director, National Reconnaissance Office |
| **Gen Donald Kutyna, USAF (Ret.)** | Former Commander-in-Chief United States Space Command |
| **Michael Ladomirak** | Associate Director for Acquisition, Goddard Space Flight Center, National Aeronautics and Space Administration |
| **John Landon** | Principal Director, Deputy Secretary of Defense for C3ISR and Space |
| **Kirk Lewis** | Senior Analyst, Institute for Defense Analyses |
| **Alex Liang** | Principal Director, Systems Engineering, The Aerospace Corporation |
| **Noel Longuemare** | Former Deputy Under Secretary of Defense for Acquisition and Technology |
| **Brad Lucas** | Office of Deputy Director of Central Intelligence for Community Management |
| **Tom Luedtke** | Associate Administrator for Procurement, National Aeronautics and Space Administration |
| **Don Mackenzie** | Senior Analyst, Wyle Laboratories |
| **Edward Mahen** | Advanced Systems & Technology Directorate, National Reconnaissance Office |
| **Bill Maikisch** | Executive Director, Air Force Space & Missiles Systems Center |
| **James Manchisi** | Vice President, Government Markets, Commercial & Government Systems, Eastman Kodak Company |
| **John Mari** | Vice President, Quality Assurance, Lockheed Martin Astronautics |

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| **G. Thomas Marsh** | President, Lockheed Martin Astronautics |
| **Roman Matherne** | Vice President, Mission Success, Lockheed Martin Astronautics |
| **Del Matz** | Acting Director, Defense Contract Management Office at Lockheed Martin Astronautics |
| **Gene H. McCall** | Chief Scientist, Air Force Space Command |
| **LtGen James P. McCarthy, USAF (Ret.)** | Olin Professor of National Security, Air Force Academy |
| **Mary McCarthy** | Director of Intelligence Programs, National Security Council |
| **LtGen Forrest McCartney, USAF (Ret.)** | Vice President, Launch Operations, Lockheed Martin Astronautics |
| **Col Richard D. McKinney, USAF** | Deputy Director of Space & Nuclear Deterrence, Office of the Assistant Secretary of the Air Force for Acquisition |
| **John McMahon** | Former Deputy Director of Central Intelligence |
| **Martin A. Meth** | Director, Industrial Capabilities and Assessments, Office of the Under Secretary of Defense for Acquisition and Technology |
| **James C. Metsala** | Director, Program Development, Commercial & Government Systems, Eastman Kodak Company |
| **Lisa Miller** | Office of General Counsel, National Reconnaissance Office |
| **Col Darphaus Mitchell, USAF** | Commander, 45th Operations Group, Air Force Space Command |
| **Page Moffett** | General Counsel, National Reconnaissance Office |
| **John Morris** | Former Director, Central MASINT Organization, Defense Intelligence Agency |

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| **LtGen George Muellner, USAF (Ret.)** | Vice President and General Manager, Phantom Works, The Boeing Company |
| **Mike Munson** | Former Deputy Director for National Support, National Reconnaissance Office |
| **Col Greg Muntzner, USAF** | Commander, Detachment 8, Air Force Space & Missiles Systems Center |
| **Rich Murphy** | Vice President, Cape Canaveral Launch Operations, The Boeing Company |
| **Dr. F. Robert Naka** | Former Deputy Director, National Reconnaissance Office |
| **Rich Niederhauser** | Director, Vandenberg Operations, The Boeing Company |
| **Kevin O'Connell** | Staff Director, Commission for the Review of the National Imagery & Mapping Agency |
| **Col James Painter, USAF** | Chief, Policy & International Affairs Division, United States Space Command |
| **Robert Pattishall** | Former Director, Advanced Systems & Technology Directorate, National Reconnaissance Office |
| **Dr. Antonio Pensa** | Lincoln Laboratory, Massachusetts Institute of Technology |
| **Mal Peterson** | Comptroller, National Aeronautics and Space Administration |
| **Col Charles Phillips, USAF** | Vice Commander, 30th Space Wing, Air Force Space Command |
| **LtCol Betsy Pimental, USAF** | Office of the National Security Council |
| **Dominic Pohl** | Executive Officer, Mission Requirements Board, Office of Deputy Director of Central Intelligence for Community Management |

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| **Karen Poniatowski** | Director, Expendable Launch Vehicles, National Aeronautics and Space Administration |
| **Dave Raspet** | Director, Special Projects, Integrated Defense Systems, The Boeing Company |
| **Rodger C. Rawls** | Vice President, Market Development, BAE Systems |
| **Col Dave Riester, USAF** | Office of the Joint Chiefs of Staff |
| **Keith Robertson** | Cost Estimate Group, National Reconnaissance Office |
| **CAPT Matt Rogers, USN** | Signals Intelligence Directorate, National Reconnaissance Office |
| **LtCol Pete Rogers, USAF** | Corporate Operations Office, National Reconnaissance Office |
| **John Sastri** | Signals Intelligence Directorate, National Reconnaissance Office |
| **Herbert F. Satterlee, III** | Chairman, Earthwatch, Incorporated |
| **Col Robert Saxer, USAF** | System Program Director, Evolved Expendable Launch Vehicles, Air Force Space & Missiles Systems Center |
| **BGen Thomas Scanlan, USAF (Ret.)** | Vice President, Titan Program, Lockheed Martin Astronautics |
| **Kevin Scheid** | Deputy Director, Program Assessment and Evaluation Office, Office of Deputy Director of Central Intelligence for Community Management |
| **Terry Schoessow** | Principal Director, Office of Space Launch, The Aerospace Corporation |

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| **Dr. Phil Schwartz** | Superintendent, Remote Sensing Division, Naval Research Laboratory |
| **Col Darryl Scott, USAF** | Deputy Assistant Secretary for Contracting, Office of the Assistant Secretary of the Air Force for Acquisition |
| **Mark Scott** | Collection Resources and Evaluation Staff, Central Intelligence Agency |
| **Mark R. Seastrom** | Office of the Secretary of Defense for Program Analysis & Evaluation |
| **John H. Seely** | Assistant Director for National Intelligence, Surveillance and Reconnaissance Systems, Office of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence |
| **Laura Senty** | Collection Resources and Evaluation Staff, Central Intelligence Agency |
| **Orlando C. Severo, Jr.** | Chief Executive Officer, Spaceport Systems International |
| **Col Richard W. Skinner, USAF** | Principal Director, C3ISR and Space Systems, Office of the Assistant Secretary of Defense for Command, Control, Communications and Intelligence |
| **Britt Snider** | Inspector General, Central Intelligence Agency |
| **Albert Sofge** | Director, Office of Space Flight, National Aeronautics and Space Administration |
| **BGen Joseph B. Sovey, USAF** | Director, Imagery Intelligence Directorate, National Reconnaissance Office |
| **Mike Spence** | Director, Cape Canaveral Operations, The Aerospace Corporation |
| **Dr. Edwin B. Stear** | Vice President, Institute for Defense Analyses |

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| **Michelle Stewart** | Corporate Operations Office, National Reconnaissance Office |
| **Col Dave Svetz, USAF** | Signals Intelligence Directorate, National Reconnaissance Office |
| **LtGen Eugene Tattini, USAF** | Commander, Air Force Space & Missiles Systems Center |
| **Col Dave Trask, USAF** | Central MASINT Organization, Defense Intelligence Agency |
| **Dr. Richard Truly** | Former Administrator, National Aeronautics and Space Administration |
| **Tish Vajta-Williams** | Vice-President, Strategic Business Development, Space Imaging |
| **Victor Villhard** | Office of the President's Advisor for Science and Technology Policy |
| **Col John Wagner, USAF** | Commander, Detachment 9, Air Force Space & Missiles Systems Center |
| **Harry Waldron** | Historian, Air Force Space & Missile Systems Center |
| **Jack Welch** | Former Assistant Secretary of the Air Force for Acquisition |
| **Gen Larry Welch, USAF** | Former Chief of Staff, United States Air Force |
| **Col Daniel W. Wells, USA** | Director, Operational Support Office, National Reconnaissance Office |
| **Dr. James R. Wertz** | President, MicroCosm, Incorporated |
| **BGen Craig Weston, USAF** | Chief Information Officer and Director, Corporate Operations Office, National Reconnaissance Office |
| **Dr. Peter Wilhelm** | Director, Naval Center for Space Technology, Naval Research Laboratory |

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| **John Willacker** | Vice President, Launch Systems, The Aerospace Corporation |
| **BGen Bill Wilson, USAF** | Vice Commander, Air Force Space & Missile Systems Center |
| **Jeff Wilson** | Vice President and General Manager for Atlas and EELV Programs, Lockheed Martin Astronautics |
| **Col Steve Wojcicki, USAF** | Director, Office of Space Launch, National Reconnaissance Office |
| **Tony Wu** | Office of Management and Budget, White House |
| **Dr. Peter Young** | Professor, Massachusetts Institute of Technology |
| **Col Chip Zakrzewski, USAF** | Deputy Director, Office of Space Launch, National Reconnaissance Office |



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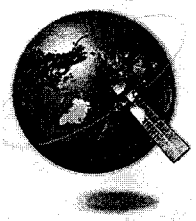

# APPENDIX D
# HISTORICAL DEVELOPMENT OF THE SECRETARY OF DEFENSE—DIRECTOR OF CENTRAL INTELLIGENCE RELATIONSHIP WITH THE NRO

**Background.** The Director of the NRO is responsible for reporting to both the Secretary of Defense and the Director of Central Intelligence (DCI). He is the head of a major component of the Intelligence Community that is also an agency of DoD. At the same time, he serves as the Assistant Secretary of the Air Force for Space. This tri-cornered arrangement has resulted in some of the greatest historical strength of the NRO because it has allowed the NRO Director to draw on the resources and benefit from the advocacy of the two major forces in the Intelligence Community and the Department of Defense.

It has also been however, the source of some of the current tensions regarding the NRO because of the ambiguity in command and accountability that is the natural consequence of the arrangement. Further, some would argue that the uncertain situation in which the NRO finds itself today—with requirements rising and budgets flat or falling—can be traced in part to that ambiguity and the resulting inadequacy of the Secretary of Defense-DCI relationship as a means for dispute resolution. On the other hand, one

prominent witness testified to the Commission that the Secretary of Defense and the DCI were appropriately "stuck with" the problem of running the NRO and simply had to make it work no matter how difficult it was, simply because of the NRO's importance to national security.

The current Secretary of Defense-DCI relationship regarding the NRO is significantly different than it was before 1990. This is due primarily to dynamic changes that have affected the NRO's traditional missions and its relationship with the various agencies it supports, and to Congressional actions that were taken in the 1990s.

**1960 – 1970: The Drift Toward DoD.** The relationship between the Secretary of Defense and the DCI regarding the NRO was originally described in four agreements that were consummated in the 1960s by a series of Deputy Secretaries of Defense and DCIs. According to the NRO General Counsel, these four agreements are all considered by the NRO to still be in effect, although a series of Executive Orders and Congressional amendments to the National Security Act of 1947 have had a significant impact on the relationship.

The first agreement is dated September 6, 1961 and was focused on the creation of a National Reconnaissance Program (NRP) within the Department of Defense to include all overt and covert satellite and over-flight reconnaissance projects. The agreement also recorded the creation of the NRO to manage the NRP under the joint direction of the Under Secretary of the Air Force and the CIA's Deputy Director for Plans who were to see to the implementation of NRO decisions within their respective organizations. The NRO was to respond to collection requirements and priorities established by the United States Intelligence Board (USIB). The NRO "Directors" were to establish procedures to ensure that "the particular talents, experience and capabilities" of

DoD and the CIA were used fully and effectively in the NRP. Major NRP program elements and operations were to be subject to regular review by a National Security Council group.

The second agreement was signed by the parties on May 2, 1962 and contained policy guidance to ensure that, as had been urged in the prior agreement, "the particular talents, experience and capabilities" of DoD and the CIA were used fully and effectively in the NRP. It provided that there would be an NRO Director designated by the DCI and Secretary of Defense and responsible directly to them both for the management and conduct of the NRP. Further, personnel from DoD and CIA were to be assigned on a full-time basis to the NRO to take advantage of available capabilities and resources and DoD and CIA were to provide funds for the projects for which each had responsibility. The agreement also established technical and financial management, security and operational policies for the NRO Director to follow in sorting out the DoD and CIA interests in the NRP. It also stated that operational control of individual NRP projects would be assigned to the DoD or CIA by the NRO Director in accordance with policy guidance from the Secretary of Defense and the DCI. Finally, the second agreement provided that the NRO Director would be responsible for future NRP planning, but that all such planning would be coordinated with the DCI because of the DCI's major responsibility for all intelligence programs.

The third agreement was dated March 13, 1963 and stated that it superseded the May 2, 1962 agreement. This agreement began to shift NRO management authority to DoD. Again in the name of ensuring effective utilization of DoD and CIA capabilities, it announced that the Secretary of Defense was the Executive Agent for the NRP. To carry out this responsibility, the Secretary was to establish the NRO as a separate operating agency within DoD. The NRO Director was to be appointed by the Secretary, with the

concurrence of the DCI, and a Deputy NRO Director was to be appointed by the DCI, with the concurrence of the Secretary. The NRO Director was to receive guidance from the Secretary and collection requirements and priorities from the USIB. The NRO Director was responsible for the management of the NRP, "subject to the direction, authority and control" of the Secretary of Defense. NRO budget requests were to be presented and substantiated by the NRO Director to the Secretary and DCI, the Bureau of the Budget and Congressional committees. The NRO Director was to report directly to the Secretary of Defense, while keeping the DCI currently informed.

The fourth agreement was completed on August 11, 1965 and was the most comprehensive. It furthered the swing of authority over the NRO to DoD and the Secretary of Defense. The agreement repeated that the Secretary was to establish the NRO as a separate agency of DoD, but made clear that he had "ultimate responsibility" for its management and operation. It also eliminated the requirement for DCI concurrence in the Secretary's selection of the NRO Director. The DCI retained authority for appointing the Deputy NRO Director, but with the concurrence of the Secretary. The agreement also provided that the Secretary had "the final power" to approve the NRP budget and established the Secretary as the final decision-maker on all NRP issues. It also created an NRP Executive Committee (EXCOM) that consisted of the Deputy Secretary of Defense, DCI and the Assistant to the President for Science and Technology. The EXCOM was empowered to "guide and participate in the formulation of the NRP" in both budget and operational detail, but the Secretary of Defense was to be responsible to decide any EXCOM disagreement on any issue. The NRO was to be staffed to reflect the best talent available from CIA, DoD and other agencies, and this staff was to "maintain no allegiance to the originating agency." Collection requirements and priorities were still to be provided by the USIB.

The Commission heard testimony that there was extreme turbulence in the DCI/Secretary of Defense relationship in the early days of the NRO. These early disagreements were centered around which agencies would be responsible for building and operating NRO systems rather than budgetary issues.

**1970 – 1978: A Swing Back to the DCI.** In November 1971, President Nixon issued a memorandum that increased the responsibility and authority of the DCI regarding the entire NFIP budget. This resulted, in early 1972, in the revision of a National Security Council Intelligence Directive (NSCID) that implemented the policy decisions contained in the presidential memorandum. The NSCID called for the DCI to chair and staff all intelligence committees and advisory boards, establish and reconcile all intelligence requirements and priorities, and submit a consolidated intelligence program and budget to the Office of Management and Budget. A few months later, the Intelligence Community Staff was created by DCI Richard Helms to support these additional functions.

In February 1973, James Schlesinger was confirmed as DCI. He had accepted the assignment based on a pledge from President Nixon that he would chair all of the intelligence committees, including the NRO EXCOM, as was now prescribed by the revised NSCID. With the DCI as EXCOM Chairman, the Deputy Secretary of Defense ceased attending meetings—he outranked the DCI at the time, and the Assistant Secretary of Defense for Intelligence began to attend in his place. President Nixon, meanwhile, dismissed the Science Advisor and dissolved the President's Science Advisory Council. This eliminated the NRO EXCOM's direct link to the President.

President Gerald Ford issued Executive Order 11905 in February 1976 to provide a public description of the structure and activities of the Intelligence Community. That Order stated that the

NRO, euphemistically identified as an office within DoD that collected intelligence through reconnaissance programs, was part of the Intelligence Community. It also established a Committee on Foreign Intelligence (CFI), which was composed of the DCI as Chairman, the Deputy Secretary of Defense for Intelligence and the Deputy Assistant to the President for National Security Affair. The CFI reported to the National Security Council and was responsible for reprogramming NFIP funds and setting priorities for collection and production of national intelligence. As a result, the NRO EXCOM was disbanded. Control of NRP funds was now in the hands of the DCI instead of the Secretary of Defense.

The Ford Order also charged DoD with, among other things, directing, funding and operating national, defense and military intelligence and reconnaissance activities. The NRO was not specifically mentioned since its existence was still classified at this time.

Also in the mid-1970s, Congress created substantial additional Congressional oversight mechanisms as a result of its investigations of excesses by the Intelligence Community. In May 1976, the U.S. Senate established the Senate Select Committee on Intelligence (SSCI). In July 1977, the U.S. House of Representatives established the House Permanent Select Committee on Intelligence. As a result, Congressional staffs became heavily involved in review of the NRP and its current and proposed programs.

In January 1978, President Jimmy Carter issued Executive Order 12036, which replaced the Ford Order. It abolished the CFI and gave "full and exclusive authority" over the preparation of the NFIP budget to the DCI. The Order also established the Policy Review Committee to assess the NFIP budget and U.S. Intelligence priorities.

By the end of 1978, the NRO Director was reporting to the DCI on matters of NRP funding and requirements, and to the Secre-

tary of Defense on operational matters associated with strategic and tactical overhead reconnaissance. The DCI continued, as had been the case from the outset, to delegate to the NRO the special acquisition authority that the National Security Act of 1947 had provided to the CIA. Congressional involvement in the NRP had increased to the point that it began to direct the initiation of specific new programs.

**Fiscal Year 1997 Intelligence Authorization Act: Restriking the Balance.** Between 1978 and 1997, the formal written framework for the Secretary of Defense-DCI relationship remained unchanged. During that time, however, a disparity developed between the specified and the actual authorities of the DCI regarding the Intelligence Community. In 1992, Congress had enacted amendments to the National Security Act that provided a statutory basis for many of the DCI responsibilities that had been adopted previously by Executive Order. As noted in the March 1996 report of the Aspin-Brown Commission on the Roles and Capabilities of the Intelligence Community, however:

> *Taking these together, the DCI appears to have considerable authority vis-à-vis other elements of the Intelligence Community. In practice, however, this authority must be exercised consistent with the authority of the department heads to whom these elements are subordinate.*
>
> ....
>
> *Notwithstanding his statutory authorities vis-à-vis the elements of the Intelligence Community, which on their face appear substantial, the DCI is left in a relatively weak position. It is not surprising, therefore, that most DCIs have chosen to spend the bulk of their time on other major functions, serving as the principal intelligence adviser to the President and head of the CIA*

*[instead of pursuing the role of head of the Intelligence Community].*

Thus, the Secretary of Defense retained substantial real authority over the activities of the NRO, despite the titular responsibilities of the DCI. In recognition of this fact, the Aspin-Brown Commission recommended strengthening the authorities of the DCI, including his authorities over the NRO.

Acting on recommendations of the 1996 Aspin-Brown Commission Report, Congress enacted provisions of law that substantially changed the overall relationship between the Secretary of Defense and the DCI regarding the NRO and the other DoD agencies that are part of the Intelligence Community. These provisions, particularly Section 807 of the Fiscal Year 1997 Intelligence Authorization Act, were designed to enhance the authority of the DCI to influence the budget, personnel and activities of the Intelligence Community.

Specifically, the DCI was given specific statutory responsibility to develop the annual National Foreign Intelligence Program budget and also to participate in the development by the Secretary of Defense of the annual budgets for the Joint Military Intelligence Program (JMIP) and the Tactical Intelligence and Related Activities Program. In addition, the DCI was given statutory authority to approve any reprogramming of funds within the NFIP and to be consulted with regard to reprogramming within the JMIP by the Secretary of Defense.

However, the DCI's actual authority to manage the NFIP budget continues to be limited substantially by his lack of authority to be involved in the execution of that budget after it is approved by Congress. In addition, Section 104 (d)(2) of the National Security Act, which was added by the FY 1992 Intelligence Authorization Act, limits the DCI's ability to move funds or personnel within the

NFIP to situations where the transfer is to an activity that is a higher priority intelligence activity, is based on unforeseen requirements, is not to the CIA Reserve for Contingencies or from the Federal Bureau of Investigation, and the head of the entity that contains the affected element or elements does not object. Section 105 of the FY 2001 Intelligence Authorization Act provides that only the head of an agency has authority to object to a transfer of funds within the National Foreign Intelligence Program, except that the Deputy Secretary of Defense may object for DoD agencies and the DCI's authority to transfer funds may be delegated to the Deputy Director of Central Intelligence for Community Management.

**Other Authorities Affecting the Secretary of Defense-DCI Relationship Regarding the NRO.** The NRO is a member of the "Intelligence Community" as that term is defined in the National Security Act and Executive Order 12333. Section 105 of the National Security Act includes the NRO—along with NSA, NIMA, and DIA—among the entities that the Secretary of Defense is responsible for drawing upon to accomplish the NFIP. Under that Section, the Secretary is required to act through the NRO to ensure, consistent with the statutory responsibilities and authorities of the DCI, "the continued operation of an effective unified organization for the research and development, acquisition, and operation of overhead reconnaissance systems necessary to satisfy all elements of the intelligence community." Also, under Section 106, the Secretary is required to seek DCI concurrence in the recommendation to the President of an NRO Director and to advise the President if the DCI does not concur.

The Act also provides that the DCI is to consult with the Secretary of Defense and the Chairman of the Joints Chiefs of Staff in the development of an annual evaluation of the performance and responsiveness of the NRO, DIA, and NIMA in meeting their na-

tional missions. This Report is to be submitted to the National Security Council's Committee on Foreign Intelligence, which was also created by the 1997 amendments to the National Security Act, and to the Intelligence, Appropriations and Armed Services Committees of Congress.

As explained earlier, Executive Order 12333, "United States Intelligence Activities," was promulgated in 1981, prior to the 1992 public acknowledgment of the NRO's existence and the 1997 FY 1997 Intelligence Authorization Act amendments. The Order provides that the Secretary of Defense will direct, operate, control and provide fiscal management for, among other things, national reconnaissance entities. It also alludes to the NRO euphemistically in the category of "Offices for the collection of specialized intelligence through reconnaissance programs" in a section entitled "Intelligence Components Utilized by the Secretary of Defense." According to the Executive Order, such offices are responsible for carrying out consolidated reconnaissance programs, responding to tasking in accordance with procedures established by the DCI and delegating authority to other departments and agencies for research, development, procurement, and operations of designated means of collection.

The transition of the relationship regarding the NRO from a hierarchical one in 1961 to 1976 to a consensus-based relationship since 1976 probably was inevitable considering the general turbulence in the Intelligence Community during the 1970s and the increasing Congressional oversight of the NRP since 1976. There was considerably less stress on the relationship during periods of generally higher Intelligence Community and DoD funding, although this also was probably due to the close personal relationship between the Secretary of Defense and DCI during the same periods.

There has been no direct White House role in NRO activities since the President's Science Advisor was removed from the process in the 1970s. Some White House Science Advisors are no longer as well versed in national security issues as was formerly the case. In the absence of such focused expertise and interest, NRO issues have tended to be relegated to the lower working levels of the NSC. The Commission heard testimony that, because the President's interest in the NRO cannot be presumed, the Secretary of Defense and DCI have even more reason to attend to their relationship concerning the NRO.

No matter what form the Secretary of Defense-DCI relationship regarding the NRO should take, it is not self-executing and requires the active participation of both in order to best effect the basic mission of the NRO. This basic point was made again and again to the Commission by past and present senior officials. Because the work of the NRO continues even during periods of Secretary of Defense or DCI lack of interest or participation in the relationship, the result is that successively lower levels of officials may be left to "manage" the NRO on behalf of the two principals. Friction among the NRO and other agencies has developed in such periods. Two former senior officials who served in different Administrations, strongly believed that the NRO should be the subject of at least a weekly discussion between the Secretary of Defense and the DCI.



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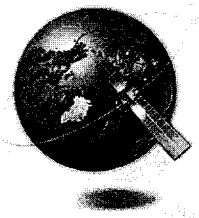


# APPENDIX E
# PIONEERS IN SPACE RECONNAISSANCE: A BRIEF HISTORY OF THE NRO

Americans have found themselves captivated by adventure novels like Tom Clancy's "Patriot Games" that come to life on the big screen. The scenes depicting the use of U.S. spy satellites add to the intrigue. We are mesmerized as a spy satellite transmits what appears to be real-time video of a night assault by U.S. Special Operations Forces on a terrorist camp located in the Sahara Desert. The satellite images vividly depict the assault force in action and terrorists dropping to the ground from close-range gunfire. They convey a sense of CNN-like coverage of breaking news.

***It was during the Cold War period of pioneering technological achievements in space reconnaissance that the NRO emerged and enjoyed the greatest levels of recognition and support for its programs at the highest levels of the U.S. Government.***

The capabilities of these "movie satellites" (not constrained by the laws of physics) are the result of computer-simulated graphics and skillful special effects. Nonetheless, the premise for such capabilities is the spectacular technological achievements in satellite reconnaissance pioneered by the National Reconnaissance Office (NRO).

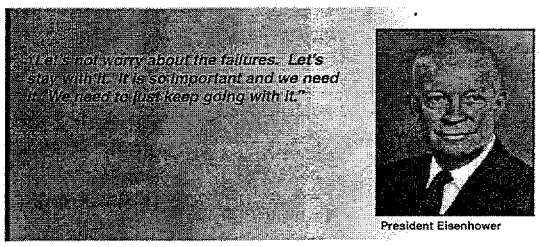
The NRO emerged at the height of the Cold War. During that time in U.S. history, the nation faced the threat of destruction from a nuclear attack. The Soviet Union's nuclear weapons and closed

Communist society were the dominant threat to U.S. national security. Weekly civil defense drills and backyard bomb shelters instilled a real sense of "clear and present danger" to the American public.

The lack of insight into the Soviet Union during the early days of the Cold War and the fear of its nuclear arsenal were the focus of national attention. Tensions between the United States and the Soviet Union were high. Ambiguous and conflicting information from traditional intelligence sources concerning the extent of Soviet nuclear capabilities threatened to fuel the nuclear arms race. The risk of nuclear war led the U.S. Air Force to consider building as many as 10,000 ICBMs to counter the perceived threat. The Strategic Air Command flew around-the-clock airborne alert missions with B-52 bombers armed with nuclear warheads in order to deter the USSR from launching a preemptive nuclear strike on the United States.

In an effort to gain timely and more accurate information concerning Soviet capabilities, President Eisenhower initiated a covert program to develop an overhead reconnaissance capability to gather intelligence on the development, capabilities, location, and readiness of Soviet strategic nuclear forces. Advanced technology elements of the CIA and the Air Force were joined together to attack this problem. They rapidly developed the U-2 reconnaissance aircraft, which was able to penetrate Soviet airspace at higher altitudes than those at which Soviet fighters could then operate.

**Great technical advances do not come without trial...and some errors**




President Eisenhower

However, in their four years of operation, the U-2s were able to cover only one-tenth of the 10 million square miles of the USSR and provide only limited insight into Soviet strategic nuclear capabilities. Further, these flights were ended on May 1, 1960 after a U-2 piloted by Francis Gary Powers was shot down by a Soviet surface-to-air missile. Powers was captured and the Soviets turned the incident into a major propaganda event. As a result, the need for a satellite reconnaissance capability to provide assured access over denied Soviet territory became paramount to U.S. national security.

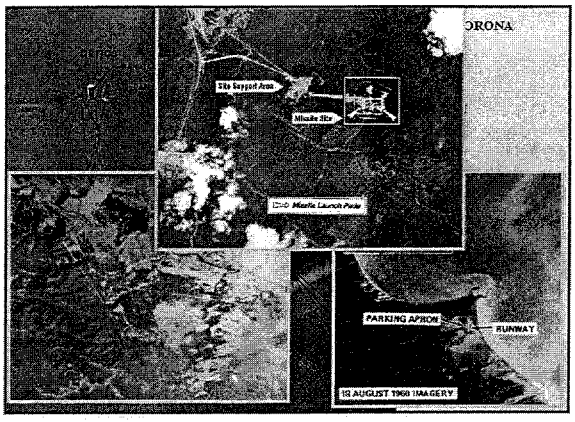
The Air Force and CIA had been working on covert reconnaissance capabilities from space for some time. This was a high-risk effort and the program suffered a dozen failed missions before achieving its first success in August 1960.

The then-covert program, named Corona, finally yielded results that were considered spectacular at the time. The amount of Soviet territory covered in the film recovered from the very first Corona mission, for example, exceeded the area that had been covered previously by all the U-2 flights.

The information collected by Corona provided U.S. military planners and policy-makers with concrete evidence that the Soviet Union did not have overwhelming strategic superiority as had been feared. Subsequently, knowledge of the size and characteristics of Soviet nuclear forces made verification of arms control treaties possible and enabled the firm U.S. response to Soviet military expansion in the 1980s that eventually induced the USSR to collapse.

Like the Air Force in its efforts to collect imagery, the Navy and Air Force had tried to gather electronic radar signals intelligence (ELINT) by conducting aircraft flights along the periphery of the USSR, but these efforts could never provide more than a fraction

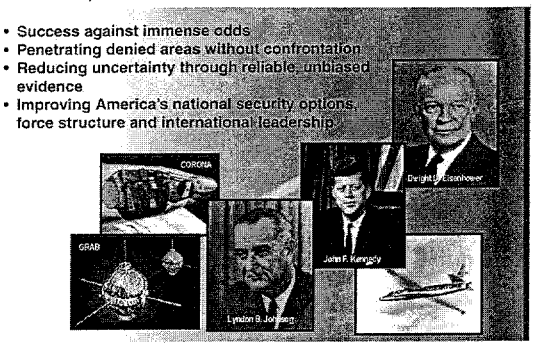
## Looking Behind The Iron Curtain




of the required intelligence. As a result, the Navy in 1958 proposed an ELINT satellite. The proposal was supported by the Department of Defense and CIA, and was approved by President Eisenhower in 1959. The Naval Research Laboratory developed the satellite under the cover of an experimental solar radiation research satellite called GRAB (Galactic Radiation and Background). The first launch in June 1960 succeeded in orbiting a GRAB satellite. Like Corona, however, many early GRAB missions were unsuccessful and four of the next five missions failed. The program nevertheless continued.

The data provided by the successful GRAB missions were priceless. The ELINT was used to develop operational plans for retaliatory strikes against the Soviet Union in the event of war. The National Security Agency analyzed and catalogued the data, determining from it, for example, that the Soviets were operating a radar in support of an anti-ballistic missile capability as early as the early 1960s. Navy programs were incorporated into NRO in 1962. GRAB was succeeded by other NRO satellite collectors of signals intelligence that have operated ever since.

## Pioneering and Persevering
(1960-1969)




A more recent example of the NRO's contribution to U.S. national security is the electro-optical imagery satellite program. The Corona photographic satellite system had limitations. The duration of missions was limited by the amount of film that could be carried on board, and the images obtained were not available to users for days or weeks after they were taken since all film had to be expended and the film capsule recovered before it could be processed.

NRO engineers addressed these challenges. They were able to develop an electronic "eye" that was able to convert light waves into electrical signals that could be relayed to Earth in near-real time. This and other technologies necessary electro-optical satellite system developed by the NRO have found their way into commercial and individual uses, including commercial electro-optical imagery satellites.

The NRO's real-time imagery satellite program was a lengthy effort. It was costly and often the subject of intense budgetary debate. Fortunately, influential individuals like Deputy Secretary of Defense David Packard, a founder of the Hewlett-Packard Corporation and an electrical engineer, were able to understand the program's technical feasibility and value and lent it their full support.

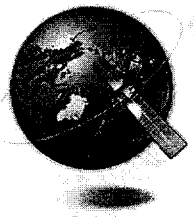
The first electro-optical satellite reconnaissance system—the name of which is still classified—was deployed by the NRO in 1976. The electro-optical imagery satellite system was declared operational by President Jimmy Carter on his first day in office, January 20, 1977.

Those satellites, and their improved successors, have enabled the United States to base its national security strategy on facts rather than fear and on empirical evidence rather than speculation. As President Lyndon B. Johnson said, commenting in March 1967 on the value of the NRO's photo-reconnaissance satellites:

> *...we've spent thirty-five or forty billion dollars on the space program. And if nothing else had come out of it except the knowledge we've gained from space photography, it would be worth ten times what the whole program cost. Because tonight we know how many missiles the enemy has and, it turned out, our guesses were way off. We were doing things we didn't need to do. We were building things we didn't need to build. We were harboring fears we didn't need to harbor.*

It was during this Cold War period of pioneering technological achievements in space reconnaissance that the NRO enjoyed the greatest levels of recognition and support for its programs at the highest levels of the U.S. Government. The technologies pioneered and developed by the NRO forty years ago were just as amazing in their day as the simulated technological capabilities portrayed in the cinema today.

Armed with intelligence provided by NRO, the United States was able to out last Soviet power and now is able to lead the world into a new century which hopefully will be less violent and destructive than the last.



# APPENDIX F
# NRO ACQUISITION STRENGTHS

## Background

The statute that established the Commission directed, among other tasks, a review of NRO roles and missions. One of the foremost of NRO's roles and missions is research, development and acquisition (RD&A) of satellites. As part of its work, the Commission conducted a study to better understand these issues by drawing comparisons between the NRO and other U.S. Government organizations that conduct RD&A of satellites[1]: the U.S. Air Force and NASA. The Commission's study posed three questions:

- What are the NRO's strengths, if any, relative to the Air Force and NASA?
- What are the sources of those strengths?
- What is changing with respect to those sources?

The answers to these questions are closely related to the other Commission findings and judgments included in the Commission Report. In particular, the NRO's strengths as a builder of satellites are highly relevant to issues involving the scope of the NRO mission and the extent to which the NRO should be involved in developing technology solutions for tasking, processing, exploitation, and dissemination. NRO strengths and the sources of those

[1] One of the assumptions made in the study was that the most worthwhile comparison was between satellites and satellites, rather than between satellites and other complex systems, such as aircraft.

strengths are also pertinent to the question of how best to prepare NRO for the future, as discussed starting on page 35 of the Report.

In this Report, the Commission determined that actions must be taken to enable the NRO to engage in the most advanced RD&A efforts so that it will be able to place the most advanced reconnaissance satellites in orbit. This finding is partly based on a study finding that the NRO has excelled in engineering creativity and has consistently sought and delivered high performance in its satellites.

The study took account of all major NRO programs since the 1960's, encompassing imagery intelligence (IMINT), signals intelligence (SIGINT), and communications satellites. The analysis also examined Air Force programs since the 1960's, comprising satellite programs for weather, infrared missile warning, navigation (Global Positioning System), and military communications. Commission analysts initially examined a subset of NASA programs, limited to unmanned, earth-orbiting satellites, also going back to the 1960's.

NRO, Air Force and NASA programs were compared in terms of cost, schedule and performance, including factors such as complexity of the satellite systems and the extent of technological innovation. The data to support a comparison of NRO with Air Force and NASA were limited largely because of inconsistent methods for tracking and retaining information within the three organizations.

It was recognized early on in the analysis that any comparison would be subject to several significant caveats and qualifications. Chief among these was that NRO, Air Force and NASA satellite RD&A efforts might not be subject to comparison because of the wide differences between the missions of the three organizations.

The differences between, for example, Air Force navigation satellites, NRO imagery satellites, and NASA weather satellites might be so fundamental that RD&A comparisons would not be feasible. Nonetheless, historically some have judged the NRO as being "better" than the others. The Packard Commission on DoD acquisition reform completed in the mid-1980's is one of the most notable examples. In any case, the Commission found it useful instead to pursue the comparison in order to determine and identify NRO strengths.

## Key Findings

**Cost, Schedule and Performance.** The point of departure for the study was to compare NRO, Air Force and NASA RD&A efforts for cost, schedule and system performance efforts, the traditional measures of RD&A performance. In this regard, the Commission study resulted in three basic finding:

- First, with a few exceptions (the Air Force's communications satellites MILSTAR I and II), NRO satellites cost significantly more than Air Force satellites.
- Second, it requires about the same number of years to research, design and build NRO and Air Force satellites. Whether RD&A time for the satellite is measured from initial contract award or concept initiation, both NRO and Air Force have similar durations for satellite RD&A, as shown in Figure 1.
- Finally, the analysis determined that the NRO has developed satellites that are consistently more complex than Air Force satellites.

With regard to this last point, the finding was derived from the study's effort to compare the NRO to Air Force for system performance, inasmuch as system performance is one of the

dimensions of an organization's overall acquisition performance. However, there is no comprehensive measure of satellite performance that allows comparison between satellites built to accomplish widely different missions. To remedy this, the Commission used a proxy measure for performance: satellite complexity. The unclassified results for the relative complexity of (a subset of) NRO, Air Force and NASA satellites are shown in Figure 2.

**Figure 1: NRO, Air Force, and NASA Satellite Development Times**

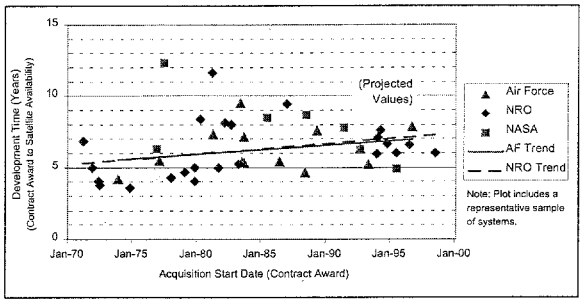
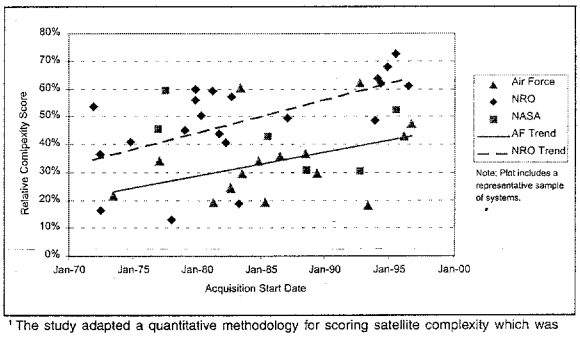



**Figure 2: Relative Complexity of NRO, Air Force, and NASA Satellites.**




Thus, while NRO and Air Force satellites take comparable times to develop, NRO satellites are both more costly and more complex. By themselves, however, these findings do not answer the question

[1] The study adapted a quantitative methodology for scoring satellite complexity which was developed by the Aerospace Corporation. The methodology was originally developed to examine NASA acquisition of "Faster, Better, Cheaper" satellites. The Commission's study adapted the methodology to better apply to NRO and Air Force satellites. Using the adapted methodology, Commission analysts determined satellite complexity based on twenty-five technical parameters such as pointing accuracy, solar array area, and maximum linear dimension.

concerning NRO's strengths. In particular, why has the NRO developed more complex satellites?

**Factors relating to greater NRO complexity.** In examining factors that might account for the greater complexity of NRO satellites, the study focused on pressures from external stakeholders, funding differences, and differences in organization. Using historical data, the study found that, relative to the Air Force, the NRO has been subject to more pressure from the U.S. national security and intelligence communities to develop new satellites. Much of this pressure was related to the imperative to collect intelligence about Soviet weapons developments where satellite-derived IMINT and SIGINT represented the best or, in some cases, the only option for the United States. In contrast, although the Air Force was subject to pressures in the 1960s for new systems and subsequent influences to improve its satellites, the pressures were less than those placed on the NRO.

A further factor in the greater complexity of NRO satellites is differences in funding levels. By examining appropriated funds since 1967, Commission analysts found the NRO has been consistently funded at levels significantly greater than the Air Force for development and operation of satellites and their related ground systems. More funding provides greater opportunities for more research, leading in turn to more complex developments.

Finally, based largely on its historical classified status, the NRO was able to create and maintain certain organizational features that contributed to innovation. The NRO, unlike the Air Force, was able to organize the conduct of both RD&A within the same organization, in a cohesive way.

In addition, the historically classified status of the NRO allowed it a great measure of discretion in using appropriated funds because they were contained in relatively few accounts. The NRO

was also relatively insulated from the type of yearly budget turbulence encountered by the Air Force across its many space and non-space programs.

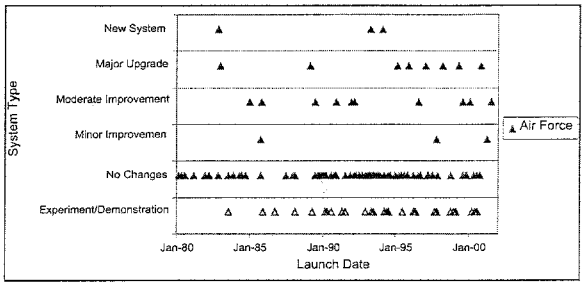
Thus, the greater complexity of NRO satellites can be traced to: greater external pressure for performance improvements (in new systems); a much higher and consistent level of funding; and a more cohesive and insulated approach to RD&A. It is worth noting that all three of these factors supporting satellite complexity derive from the NRO mission to build and operate classified satellite reconnaissance systems.

**Additional factors characterizing the NRO's Approach.** With a better understanding of the sources of NRO satellite complexity, the Commission analysis sought deeper insight into how the NRO and the Air Force approaches differed. To this end, NRO and Air Force program offices provided data regarding whether their satellites were new systems, major upgrades, moderate improvements, minor improvements, unchanged (clones), or experiments or demonstrations. The Air Force satellites in this comparison are shown in Figure 3. While the NRO part of this comparison is classified, it can be stated that the NRO satellites populate the upper third of the Figure to a much greater extent than the Air Force satellites. The review indicated that the NRO has undertaken more new systems and more major upgrades, and the Air Force has pursued more moderate or minor upgrades or clones.

In addition to initiating more new starts and major and moderate upgrades to satellites than the Air Force, the NRO has had more distinct variants of systems since the 1960s.

To understand these data, analysts examined the sources of requirements for satellite development. One finding, previously stated, was that the NRO has had more pressure from external

**Figure 3: Characterization of Air Force Satellites Launched Since 1980**




users for *new* systems. However, when looking at the sources or requirements for *upgrades*, the study found less evidence for pressures from users. Based on interview data, analysts found that the origin of upgrades to NRO satellite performance was not based on approved user requirements as much as on NRO engineers pursuing, with industry, the "art of the possible" in technology based on broadly defined Intelligence Community problems. This "enabled creativity" of the NRO-industry partnership provided the engine for NRO's high tempo of major and moderate upgrades to systems, resulting in a series of successive, incremental—though often significant—improvements in performance.

In contrast, the Air Force had to operate within original requirements for systems, and introduced new systems and upgrades within a more rigid framework of approved user requirements and carefully controlled funds appropriated for very specific purposes.

Another relevant factor was the extent to which the NRO and Air Force were able to take advantage of technological heritage, i.e., useful technology from prior systems, in RD&A of new systems and upgrades.

Air Force satellite programs have had a high degree of heritage, with many clones and incremental improvements. The first new, low-heritage Air Force system in decades, MILSTAR I and II, was more costly then expected. The NRO has introduced a larger

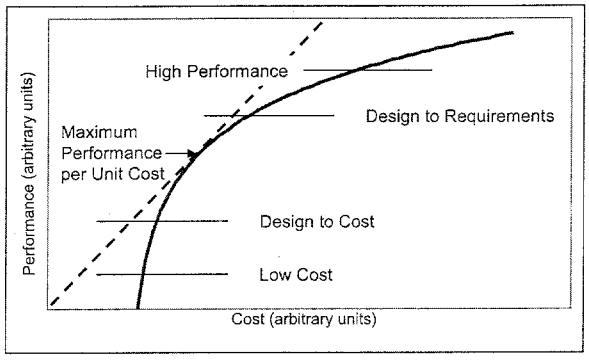
number of new, low heritage systems, with many successes and a few programs with overruns and schedule slippages. However, most NRO systems and new systems or upgrades have tended to take advantage of a moderate to high degree of heritage from previous systems. This does not mean that these NRO systems were inexpensive. Rather, NRO's approach to RD&A often benefited from a moderate to high heritage with prior systems and significant funding for upgrades.

**NRO's "comparative advantage."** The study found that part of the "comparative advantage" of the NRO relative to the Air Force is that the NRO has been able to pursue "technological depth" within a relatively focused, space reconnaissance-related set of problems, with high heritage for many important initiatives. The NRO relatively narrow focus allowed it to pursue technological solutions in depth. High levels of funding, an ability to transfer money quickly between programs and a cohesive approach to RD&A, provided the NRO the flexibility to produce more complex systems.

**NRO's high performance approach.** The NRO and the Air Force have generally taken different approaches to trading cost versus performance, with NRO taking what can be termed "the performance over cost approach." In terms of the notional trade-offs between performance and cost, shown in Figure 4, small increments in performance come at significantly more cost, shown at the right end of the curve. When plotted on a similar chart, NRO satellites typically demonstrate "a high performance approach" and Air Force satellites demonstrate the "design to requirements" approach.

The NRO's focus on high performance is reflected in higher satellite development costs and in the fact that it has made continuous efforts to improve intelligence collection systems. The NRO approach has resulted in advances in the state of the art, both in terms of the targets of intelligence collection, and in terms of

**Figure 4: Cost and Performance Options**




higher performance spacecraft. The NRO emphasis on performance was recently cited in a public remark by the Director of the NRO: "We have an outstanding record of delivering capability better than we were asked to do. In the past, NRO program managers were told to err on the side of best performance, rather than cost or schedule."

## Additional Findings

Complementing the key findings described above, the study produced additional findings that also bear on the question of the strengths of the NRO.

- First, the basic finding about the greater complexity and "enabled creativity" of the NRO does not imply that Air Force programs are mundane while NRO programs are advanced. Rather, satellite-related RD&A, whether Air Force, NRO or NASA, is always difficult. As already seen, NRO and Air Force satellite development times are comparable, despite more streamlined NRO decision processes. Even with high levels of heritage, it is difficult to ensure that systems engineering of each component and sub-system keeps pace, and that overall systems integration is also proceeding apace. In a few cases, NRO, Air Force and NASA have

suffered cost overruns and schedule slippages. Moreover, whether the acquiring organization is NRO, the Air Force, or NASA, the same set of industry partners is involved, and they seem to encounter similar kinds of problems regardless of the acquisition agency.

- Second, the study also examined the investment of the NRO, Air Force and NASA in basic technologies with spacecraft applications. Because of limitations in the data, the study was unable to construct a detailed chronology for each technology investment to determine which organization had the leading role for each technological innovation. However, the list of technologies developed by each organization was impressive and innovative. Based on interview data, there was also evidence of significant cooperation between the three organizations at different times for some new technologies. There was no conclusive evidence that the NRO was alone in terms of setting the standard for space systems innovation.

While there is some evidence that NRO and Air Force satellites have comparable costs per pound, the heaviest satellites have been developed by NRO.

## Analytical Judgments

**Different organizational approaches to RD&A .** The NRO, the Air Force and NASA have highly different approaches to satellite RD&A. The NRO historically has built "niche" satellites that have relatively specialized missions and users. Further, the NRO has historically been under more external pressure for new system performance. Moreover, it has had a relatively narrow mission focus—IMINT, SIGINT and supporting communications—and very high technology content. The NRO "paradigm" has been a quest for high performance, in response to intelligence needs,

with frequent new starts and continual improvements to existing systems.

In contrast, the Air Force's systems are designed for a wider user base. The Air Force's satellite RD&A activities programs are highly diverse in terms of different satellite missions. Further, its satellite design and performance specifications are more highly tied to formal, approved user requirements. In addition, the Air Force preference is to stabilize design rapidly and move to more serial production, rather than adding improvements for each successive vehicle of a satellite generation.

Contrasting to both the NRO and the Air Force, the NASA approach to satellite and spacecraft development maybe best described as "let a thousand flowers bloom" within a budget historically that has been larger than that for NRO and Air Force space programs combined. NASA programs are extremely diverse, more so than those of the Air Force. NASA programs have very high technology content, like the NRO. With the exception of weather satellites, NASA satellites and spacecraft are virtually all "one-of-a-kind" or "few of a kind," requiring extensive R&D. Overall, the engineering creativity and quest for performance demonstrated in NRO programs applies equally well to many NASA programs.

**NRO strengths.** The NRO has certain strengths:

- The NRO conducts R&D on and builds highly complex, classified satellites, with a continuous quest and funding for performance improvements
- Part of the NRO approach has been the ability to undertake new start satellite projects successfully, both with and without a high degree of prior heritage.

**Sources of NRO strengths.** The Commission study found four sources for the NRO's strengths:

- the NRO has had significant freedom of maneuver within a relatively narrow set of missions, allowing development of "technological depth."
- the NRO has benefited from an experienced and long-duration career work force that allowed it to pursue the "art of the possible" with industry and users;
- the NRO has benefited from relatively insulated, highly discretionary and flexible funding to allow pursuit of "technological depth;" and
- while NRO acquisition authorities and streamlined practices did not result in shorter development times, they probably did allow some cost reduction, closer relationships with industry and a high level of performance upgrades.

**Changes in sources of NRO success.** An additional judgment is that some of the conditions that produced historical NRO success relative to the Air Force are undergoing change. The NRO mission is increasingly wide and the NRO is increasingly tied to wider requirements processes. There has been a shift away from NRO ability to maintain an experienced, long-duration work force. In addition, while NRO acquisition authorities remain unchanged, there has been an erosion in some key features of the NRO approach to RD&A: NRO funding is less insulated and it has less flexibility in use of appropriated funds.

## Conclusion

The Commission reached three main conclusions: First, the NRO, Air Force and NASA have distinct "organizational cultures" and approaches to satellite RD&A. There is little basis to conclude that one is better than another. The approaches of each are well

suited to their differing missions, and the performance of each has generally satisfied the different user communities.

Second, relative to the Air Force and NASA, the NRO has some distinct strengths, but there is a balance between strengths and weaknesses. Relative to the Air Force, the NRO has been able to produce more complex satellites, in comparable time, and at comparable costs per pound. In some cases, NRO system upgrades may be less directly tied to approved user requirements, and users have only come to value NRO improvements after the satellite is in operation.

Finally, as noted elsewhere in this Commission Report, some of the key sources of NRO successes have evolved in a way that puts some features of the NRO approach at risk. In particular, the NRO has had great successes in developing innovative, "niche" systems, whereas there are greater pressures today for it to focus much more on standardized systems with a very wide customer bases.



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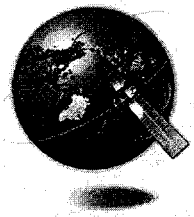


# APPENDIX G
# COMMISSION MEMBER BIOGRAPHIES

## Congressman Porter J. Goss, Co-Chairman

Porter J. Goss (R-FL) was re-appointed by the Speaker of the House to chair the House Permanent Select Committee on Intelligence (HPSCI) for the 106th Congress. This is his second term as chairman of the Committee, on which he is now serving his third term as a member. Mr. Goss has represented Southwest Florida's 14th Congressional District since 1989. In addition to chairing the HPSCI, Mr. Goss also chairs the House Rules Committee Subcommittee on Legislative and Budget Process.

A former Central Intelligence Agency Clandestine Services Officer, Mr. Goss has translated his professional experience and long-standing interest in foreign policy into legislative initiatives to further the advancement of democracy in Haiti, Nicaragua, Panama and El Salvador. He is also a member of the North Atlantic Assembly's inter-parliamentary organization and an active proponent of efforts to curtail the flow of illegal drugs into the United States. He has actively participated in strategic deliberations regarding U.S. foreign policy towards Iraq, North Korea and Russia.

As Chairman of the HPSCI, Mr. Goss has led the effort to revitalize the nation's intelligence capabilities to better meet the challenges of the next century, particularly those involving such transnational threats as weapons proliferation, narcotics trafficking and terrorism. He has been a leading voice in the call to strengthen our human intelligence and analytical capabilities, even as we

continue to invest in the best possible technology for intelligence collection.

## Senator J. Robert Kerrey, Co-Chairman

Senator Bob Kerrey is a former Governor of Nebraska, a member of the Senate Finance Committee, the Senate Agriculture Committee and recently finished serving as Vice Chairman of the Senate Select Committee on Intelligence (SSCI). He served on the Senate Appropriations Committee from 1989 through 1996. Mr. Kerrey first won election to the Senate in 1988 and was re-elected in 1994.

Born in Lincoln, Nebraska, Mr. Kerrey attended Lincoln Public Schools and graduated from the University of Nebraska at Lincoln in 1966. He then earned a spot in the elite Navy SEALs and saw combat in Vietnam. He earned the Congressional Medal of Honor, America's highest military honor, and is currently the only member of Congress who has received this honor. Returning from the war and starting from scratch in 1972, Mr. Kerrey built a chain of highly successful restaurants and health clubs that now employ more than 900 people.

Upon taking office as Governor in 1982, Mr. Kerrey balanced the state's budget in each of his four years in office. He also turned the existing deficit into a seven percent surplus upon leaving office in 1987. In addition, Mr. Kerrey initiated programs for welfare reform, education, job training and environmental protection that have become models for the nation.

## Senator Wayne Allard

U.S. Senator Wayne Allard is a Colorado veterinarian who served in the U.S. House of Representatives from Colorado's Fourth Congressional District from 1991 to 1996 before being

elected to the United States Senate in 1996. As a Colorado Congressman, Mr. Allard served on the Joint Committee on Congressional Reform.

Mr. Allard is a member of the Senate Armed Services Committee where he is Chairman of the Strategic Subcommittee; the Senate Banking, Housing and Urban Affairs Committee where he is Chairman of the Housing and Transportation Subcommittee; and the Senate Select Committee on Intelligence.

Mr. Allard was born in Fort Collins, Colorado in 1943 and raised on a ranch near Walden, Colorado. He received his doctorate of Veterinary Medicine from Colorado State University in 1968.

## Congressman Anthony C. Beilenson

Anthony C. Beilenson is a former U.S. Congressman from California's 24th Congressional District; he served in the U.S. House of Representatives from 1977 to 1997 and as Chairman of the House Permanent Select Committee for Intelligence (HPSCI) from 1989 to 1991. Prior to his election to Congress, Mr. Beilenson served in the California Assembly from 1963 to 1967 and in the California State Senate from 1967 to 1977. He is a graduate of Harvard University and Harvard Law School.

## Larry D. Cox

Mr. Cox is President of the SYGENEX Corporation, a new spin-off of ORINCON Industries. Since 1997, Mr. Cox was Vice President and Founder/Director of Special Programs at the ORINCON Corporation, a leading small-business supplier of advanced technology products and services to government and commercial customers.

Mr. Cox was recruited into NSA in 1972. He worked in the Directorate of Operations in the United States and overseas until

1983. From 1983 to 1991 Mr. Cox was a Chief Scientist and Program Manager in Space and Ground Systems at the General Electric Company in Valley Forge, PA.

From 1991 to 1995, Mr. Cox served as a Professional Staff member of the Subcommittee on Program and Budget Authorization of the House Permanent Select Committee on Intelligence (HPSCI), where he had oversight responsibility for space, advance technology, communications and remote-sensing programs.

From 1995 to 1997 Mr. Cox was Division Vice President at the Sarnoff Labs. As one of the Director's External Team, Mr. Cox performed an internal audit of NSA in 1999.

Mr. Cox is a sometimes technical advisor to the film industry.

## Joan Avalyn Dempsey

Joan Dempsey was confirmed as Deputy Director of Central Intelligence for Community Management by the U.S. Senate on May 22, 1998. This position was established in the 1997 Intelligence Authorization Act. Previously, Ms. Dempsey served as Chief of Staff for Director of Central Intelligence George Tenet beginning in July 1997.

Prior to joining the DCI staff, Ms. Dempsey served as Deputy Assistant Secretary of Defense for Intelligence and Security and Acting Assistant Secretary of Defense for Command, Control, Communications and Intelligence. She served, as well, as the Director of the National Military Intelligence Production Center, Director of the Military Intelligence Staff, and Deputy Director of the General Defense Intelligence Program Staff. She entered federal employment as a Presidential Management Intern in 1983.

## Congressman Norm Dicks

Norm Dicks, a native of Bremerton, Washington, was first elected to Congress in November 1976 and has been re-elected in every election since that time. Educated in Bremerton area elementary and secondary schools, Rep. Dicks graduated from the University of Washington School of Law in 1968. Later that year, he joined the staff of Senator Warren G. Magnuson where he served as Legislative Assistant and later as Administrative Assistant.

During the 1980's, Rep. Dicks was appointed to serve as an official observer to the US-Soviet arms reduction talks. In 1990, he was appointed to the House Permanent Select Committee on Intelligence (HPSCI). From 1995 through 1998, he served as the ranking Democratic Member of the HPSCI, and in 1998 was named the Ranking Democrat on a special Select Committee investigating technology transfer to China. Rep. Dicks was awarded the CIA Director's Medal upon completion of his service on the HPSCI in late 1998.

Rep. Dicks currently serves on the board of Visitors of the U.S. Air Force Academy and on the Congressional Advisory Council on the Henry M. Jackson Foundation. He is a member of the Washington State Bar and District of Columbia Bar, and is a member of the Council on Foreign Relations. In Washington State, he serves as an honorary member of Rotary and Kiwanis clubs in his district, and as member of the Puget Sound Naval Bases Association.

## Martin C. Faga

Martin Faga is President and Chief Executive Officer of the MITRE Corporation and a member of the MITRE Board of Trustees. He directs the company's activities, primarily the operation of three Federally Funded Research and Development Centers.

Before joining MITRE, Mr. Faga served from 1989 until 1993 as Assistant Secretary of the Air Force for Space, where he was responsible for overall supervision of Air Force space matters with primary emphasis on policy, strategy and planning. At the same time, he served as Director of the National Reconnaissance Office (NRO).

## Keith R. Hall

Keith R. Hall was confirmed by the Senate as Assistant Secretary of the Air Force (Space) on March 18, 1997, and was appointed Director of the National Reconnaissance Office (NRO) on March 28, 1997. Before joining the NRO, Mr. Hall served as Executive Director for Intelligence Community Affairs where he was the principal architect and co-chairman of the Intelligence Program Review Process. He also co-chaired the Security Policy Forum and joined the Vice Chairman, Joint Chiefs of Staff, in directing the study group that conceptualized the National Imagery and Mapping Agency. From 1991 to 1995, Mr. Hall served in the Office of the Secretary of Defense as Deputy Assistant Secretary of Defense for Intelligence and Security.

Mr. Hall held several professional staff positions with the Senate Select Committee on Intelligence (SSCI) from 1983 to 1991, including that of Deputy Staff Director. In this capacity, he was primarily responsible for supporting Committee members in the annual budget authorization process involving the Intelligence Community. He also participated in Committee oversight of intelligence programs and the review of intelligence-related legislation.

## Lieutenant General Patrick M. Hughes, U.S. Army (Retired)

Lieutenant General Hughes is President of PMH Enterprises LLC, a private consulting firm specializing in intelligence, security

and international relations. He retired from the U.S. Army on October 1, 1999 after more than 35 years of active duty service. His last assignment was Director, Defense Intelligence Agency (DIA), a position he held for 3.5 years. Other positions of responsibility included Director of Intelligence (J-2), Joint Staff and DIA; Director of Intelligence (J-2), U.S. Central Command; and Commanding General, U.S. Army Intelligence Agency.

His awards and decorations include 3 awards of the Defense Distinguished Service Medal, the Silver Star, 3 awards of the Bronze Star for Valor, the Purple Heart, the Combat Infantryman's Badge, and the Parachute Badge. He is also the recipient of the National Intelligence Distinguished Service Medal. He is the primary author of "A Primer on the Future Threat, the Decades Ahead: 1999 – 2020." Lieutenant General Hughes is a graduate of the School of Advanced Military Studies Two-Year Fellowship Program.

## Mr. Eli S. Jacobs

Mr. Eli S. Jacobs is a private investor. He has served as a member of the Defense Policy Board, the General Advisory Committee on Arms Control and Disarmament, the Chief of Naval Operations Executive Panel and on the National Reconnaissance Program Task Force. Mr. Jacobs chaired the Senate Select Committee on Intelligence's (SSCI) Panel on Counterintelligence Policy. Mr. Jacobs is a graduate of Yale University and the Yale Law School.

## Dr. William Schneider, Jr.

William Schneider, Jr. is President of International Planning Services, Inc., a Washington based international trade and finance advisory firm, and is an Adjunct Fellow of the Hudson Institute. He was formerly Under Secretary of State for Security

Assistance, Science and Technology (1982 – 1986). Dr. Schneider served as a Member of the "Rumsfeld Commission" (The Commission to Assess the Ballistic Missile Threat to the United States) established by the Congress to review intelligence information on the current and emerging ballistic missile threat to the United States. He currently serves as Chairman of the Department of State's Defense Trade Advisory Group.

Dr. Schneider is the author of several works on defense policy and has also published numerous articles and monographs on defense and foreign policy, U.S. strategic forces, theater nuclear forces, and unconventional warfare. Dr. Schneider received his Ph.D. degree from New York University in 1968. He is a member of the American Economic Association, the Econometric Society, and the International Institute for Strategic Studies.

# APPENDIX H
# LEGISLATION AUTHORIZING THE COMMISSION

## The Intelligence Authorization Act for FY 2000 (Public Law 106-120, December 3, 2000)

## Title VII—National Commission for the Review of The National Reconnaissance Office

**SEC. 701.**

### Findings

Congress makes the following findings:

(1) Imagery and signals intelligence satellites are vitally important to the security of the Nation.

(2) The National Reconnaissance Office (in this title referred to as the "NRO") and its predecessor organizations have helped protect and defend the United States for more than 30 years.

(3) The end of the Cold War and the enormous growth in usage of information technology have changed the environment in which the intelligence community must operate. At the same time, the in-

telligence community has undergone significant changes in response to dynamic developments in strategy and in budgetary matters. The acquisition and maintenance of satellite systems are essential to providing timely intelligence to national policymakers and achieving information superiority for military leaders.

(4) There is a need to evaluate the roles and mission, organizational structure, technical skills, contractor relationships, use of commercial imagery, acquisition of launch vehicles, launch services, and launch infrastructure, mission assurance, acquisition authorities, and relationship to other agencies and departments of the Federal Government of the NRO in order to assure continuing success in satellite reconnaissance in the new millennium.

SEC. 702.

## National Commission for the Review of The National Reconnaissance Office

(a) Establishment.—There is established a commission to be known as the "National Commission for the Review of the National Reconnaissance Office" (in this title referred to as the "Commission").

(b) Composition.—The Commission shall be composed of 11 members, as follows:

(1) The Deputy Director of Central Intelligence for Community Management.

(2) Three members appointed by the Majority Leader of the Senate, in consultation with the Chairman of the Select Committee on Intelligence of the Senate, one from Members of the Senate and two from private life.

(3) Two members appointed by the Minority Leader of the Senate, in consultation with the Vice Chairman of the Select

Committee on Intelligence of the Senate, one from Members of the Senate and one from private life.

(4) Three members appointed by the Speaker of the House of Representatives, in consultation with the Chairman of the Permanent Select Committee on Intelligence of the House of Representatives, one from Members of the House of Representatives and two from private life.

(5) Two members appointed by the Minority Leader of the House of Representatives, in consultation with the ranking member of the Permanent Select Committee on Intelligence of the House of Representatives, one from Members of the House of Representatives and one from private life.

The Director of the National Reconnaissance Office shall be an ex officio member of the Commission.

(c) Membership.—

(1) The individuals appointed as members of the Commission shall be individuals who are nationally recognized for expertise, knowledge, or experience in—

(A) technical intelligence collection systems and methods;

(B) research and development programs;

(C) acquisition management;

(D) use of intelligence information by national policymakers and military leaders; or

(E) the implementation, funding, or oversight of the national security policies of the United States.

(2) An official who appoints members of the Commission may not appoint an individual as a member of the Commission if,

in the judgment of the official, such individual possesses any personal or financial interest in the discharge of any of the duties of the Commission.

(3) All members of the Commission appointed from private life shall possess an appropriate security clearance in accordance with applicable laws and regulations concerning the handling of classified information.

(d) Co-Chairs.—

(1) The Commission shall have two co-chairs, selected from among the members of the Commission.

(2) One co-chair of the Commission shall be a member of the Democratic Party, and one co-chair shall be a member of the Republican Party.

(3) The individuals who serve as the co-chairs of the Commission shall be jointly agreed upon by the President, the Majority Leader of the Senate, the Minority Leader of the Senate, and Speaker of the House of Representatives, and the Minority Leader of the House of Representatives.

(e) Appointment; Initial Meeting.—

(1) Members of the Commission shall be appointed not later than 45 days after the date of the enactment of this Act.

(2) The Commission shall hold its initial meeting on the date that is 60 days after the date of the enactment of this Act.

(f) Meetings; Quorum; Vacancies.—

(1) After its initial meeting, the Commission shall meet upon the call of the co-chairs of the Commission.

(2) Six members of the Commission shall constitute a quorum for purposes of conducting business, except that two

members of the Commission shall constitute a quorum for purposes of receiving testimony.

(3) Any vacancy in the Commission shall not affect its powers, but shall be filled in the same manner in which the original appointment was made.

(4) If vacancies in the Commission occur on any day after 45 days after the date of the enactment of this Act, a quorum shall consist of a majority of the members of the Commission as of such day.

(g) Actions of Commission.—

(1) The Commission shall act by resolution agreed to by a majority of the members of the Commission voting and present.

(2) The Commission may establish panels composed of less than the full membership of the Commission for purposes of carrying out the duties of the Commission under this title. The actions of any such panel shall be subject to the review and control of the Commission. Any findings and determinations made by such a panel shall not be considered the findings and determinations of the Commission unless approved by the Commission.

(3) Any member, agent, or staff of the Commission may, if authorized by the co-chairs of the Commission, take any action which the Commission is authorized to take pursuant to this title.

SEC. 703.

## Duties of Commission

(a) In General.—The duties of the Commission shall be—

(1) to conduct, until not later than the date on which the Commission submits the report under section 708(a), the review described in subsection (b); and

(2) to submit to the congressional intelligence committees, the Director of Central Intelligence, and the Secretary of Defense a final report on the results of the review.

(b) Review.—The Commission shall review the current organization, practices, and authorities of the NRO, in particular with respect to—

(1) roles and mission;

(2) organizational structure;

(3) technical skills;

(4) contractor relationships;

(5) use of commercial imagery;

(6) acquisition of launch vehicles, launch services, and launch infrastructure, and mission assurance;

(7) acquisition authorities; and

(8) relationships with other agencies and departments of the Federal Government.

**SEC. 704.**

## Powers of Commission

(a) In General.—

(1) The Commission or, on the authorization of the Commission, any subcommittee or member thereof, may, for the purpose of carrying out the provisions of this title—

(A) hold such hearings and sit and act at such times and places, take such testimony, receive such evidence, and administer such oaths; and

(B) require, by subpoena or otherwise, the attendance and testimony of such witnesses and the production of such books, records, correspondence, memoranda, papers, and documents, as the Commission or such designated subcommittee or designated member considers necessary.

(2) Subpoenas may be issued under paragraph (1)(B) under the signature of the co-chairs of the Commission, and may be served by any person designated by such co-chairs.

(3) The provisions of sections 102 through 104 of the Revised Statutes of the United States (2 U.S.C. 192-194) shall apply in the case of any failure of a witness to comply with any subpoena or to testify when summoned under authority of this section.

(b) Contracting.—The Commission may, to such extent and in such amounts as are provided in advance in appropriation Acts, enter into contracts to enable the Commission to discharge its duties under this title.

(c) Information from Federal Agencies.—The Commission may secure directly from any executive department, agency, bureau, board, commission, office, independent establishment, or instrumentality of the Government information, suggestions, estimates, and statistics for the purposes of this title. Each such department, agency, bureau, board, commission, office, establishment, or instrumentality shall, to the extent authorized by law, furnish such information, suggestions, estimates, and statistics directly to the Commission, upon request of the co-chairs of the Commission. The Commission shall handle and protect all classified informa-

tion provided to it under this section in accordance with applicable statutes and regulations.

(d) Assistance from Federal Agencies.—

(1) The Director of Central Intelligence shall provide to the Commission, on a non-reimbursable basis, such administrative services, funds, staff, facilities, and other support services as are necessary for the performance of the Commission's duties under this title.

(2) The Secretary of Defense may provide the Commission, on a non-reimbursable basis, with such administrative services, staff, and other support services as the Commission may request.

(3) In addition to the assistance set forth in paragraphs (1) and (2), other departments and agencies of the United States may provide the Commission such services, funds, facilities, staff, and other support as such departments and agencies consider advisable and as may be authorized by law.

(4) The Commission shall receive the full and timely cooperation of any official, department, or agency of the United States Government whose assistance is necessary for the fulfillment of the duties of the Commission under this title, including the provision of full and current briefings and analyses.

(e) Prohibition on Withholding Information.—No department or agency of the Government may withhold information from the Commission on the grounds that providing the information to the Commission would constitute the unauthorized disclosure of classified information or information relating to intelligence sources or methods.

(f) Postal Services.—The Commission may use the United States mails in the same manner and under the same conditions as the departments and agencies of the United States.

(g) Gifts.—The Commission may accept, use, and dispose of gifts or donations of services or property in carrying out its duties under this title.

SEC. 705.

## Staff of Commission

(a) In General.—

(1) The co-chairs of the Commission, in accordance with rules agreed upon by the Commission, shall appoint and fix the compensation of a staff director and such other personnel as may be necessary to enable the Commission to carry out its duties, without regard to the provisions of title 5, United States Code, governing appointments in the competitive service, and without regard to the provisions of chapter 51 and sub-chapter III or chapter 53 of such title relating to classification and General Schedule pay rates, except that no rate of pay fixed under this subsection may exceed the equivalent of that payable to a person occupying a position at level V of the Executive Schedule under section 5316 of such title.

(2) Any Federal Government employee may be detailed to the Commission without reimbursement from the Commission, and such detailee shall retain the rights, status, and privileges of his or her regular employment without interruption.

(3) All staff of the Commission shall possess a security clearance in accordance with applicable laws and regulations concerning the handling of classified information.

(b) Consultant Services.—

(1) The Commission may procure the services of experts and consultants in accordance with section 3109 of title 5, United States Code, but at rates not to exceed the daily rate paid a person occupying a position at level IV of the Executive Schedule under section 5315 of such title.

(2) All experts and consultants employed by the Commission shall possess a security clearance in accordance with applicable laws and regulations concerning the handling of classified information.

SEC. 706.

## Compensation and Travel Expenses

(a) Compensation.—

(1) Except as provided in paragraph (2), each member of the Commission may be compensated at not to exceed the daily equivalent of the annual rate of basic pay in effect for a position at level IV of the Executive Schedule under section 5315 of title 5, United States Code, for each day during which that member is engaged in the actual performance of the duties of the Commission under this title.

(2) Members of the Commission who are officers or employees of the United States or Members of Congress shall receive no additional pay by reason of their service on the Commission.

(b) Travel Expenses.—While away from their homes or regular places of business in the performance of services for the Commission, members of the Commission may be allowed travel expenses, including per diem in lieu of subsistence, in the same manner as persons employed intermittently in the Government

service are allowed expenses under section 5703(b) of title 5, United States Code.

SEC. 707.

## Treatment of Information Relating to National Security.

(a) In General.—

(1) The Director of Central Intelligence shall assume responsibility for the handling and disposition of any information related to the national security of the United States that is received, considered, or used by the Commission under this title.

(2) Any information related to the national security of the United States that is provided to the Commission by a congressional intelligence committee may not be further provided or released without the approval of the chairman of such committee.

(b) Access after Termination of Commission.—Notwithstanding any other provision of law, after the termination of the Commission under section 708, only the Members and designated staff of the congressional intelligence committees, the Director of Central Intelligence and the designees of the Director, and such other officials of the executive branch as the President may designate shall have access to information related to the national security of the United States that is received, considered, or used by the Commission.

SEC. 708.

## Final Report; Termination

(a) Final Report. Not later than November 1, 2000, the Commission shall submit to the congressional intelligence committees, the Director of Central Intelligence, and the Secretary of Defense a final report as required by section 703(a).

(b) Termination.—

(1) The Commission, and all the authorities of this title, shall terminate at the end of the 120-day period beginning on the date on which the final report under subsection (a) is transmitted to the congressional intelligence committees.

(2) The Commission may use the 120-day period referred to in paragraph (1) for the purposes of concluding its activities, including providing testimony to committees of Congress concerning the final report referred to in that paragraph and disseminating the report.

SEC. 709.

## Assessments of Final Report

Not later than 60 days after receipt of the final report under section 708(a), the Director of Central Intelligence and the Secretary of Defense shall each submit to the congressional intelligence committees an assessment by the Director or the Secretary, as the case may be, of the final report. Each assessment shall include such comments on the findings and recommendations contained in the final report as the Director or Secretary, as the case may be, considers appropriate.

SEC. 710.

## Inapplicability of Certain Administrative Provisions.

(a) Federal Advisory Committee Act.—The provisions of the Federal Advisory Committee Act (5 U.S.C. App.) shall not apply to the activities of the Commission under this title.

(b) Freedom of Information Act.—The provisions of section 552 of title 5, United States Code (commonly referred to as the Freedom of Information Act), shall not apply to the activities, records, and proceedings of the Commission under this title.

SEC. 711.

## Funding

(a) Transfer from NRO.—Of the amounts authorized to be appropriated by this Act for the National Reconnaissance Office, the Director of the National Reconnaissance Office shall transfer to the Director of Central Intelligence $5,000,000 for purposes of the activities of the Commission under this title.

(b) Availability In General.—The Director of Central Intelligence shall make available to the Commission, from the amount transferred to the Director under subsection (a), such amounts as the Commission may require for purposes of the activities of the Commission under this title.

(c) Duration of Availability.—Amounts made available to the Commission under subsection (b) shall remain available until expended.

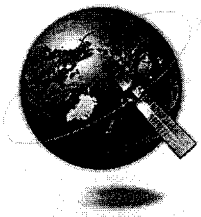
SEC. 712.

## Congressional Intelligence Committees Defined

In this title, the term "congressional intelligence committees" means the following:

(1) The Select Committee on Intelligence of the Senate.

(2) The Permanent Select Committee on Intelligence of the House of Representatives.



# APPENDIX I
# RELEVANT STATUTORY AND EXECUTIVE ORDER PROVISIONS

## National Security Act of 1947 (as amended)

### Sec. 403-3.
### Responsibilities of Director of Central Intelligence

(a) Provision of intelligence.

(1) Under the direction of the National Security Council, the Director of Central Intelligence shall be responsible for providing national intelligence—

(A) to the President;

(B) to the heads of departments and agencies of the executive branch;

(C) to the Chairman of the Joint Chiefs of Staff and senior military commanders; and

(D) where appropriate, to the Senate and House of Representatives and the committees thereof.

(2) Such national intelligence should be timely, objective, independent of political considerations, and based upon all sources available to the intelligence community.

(b) National Intelligence Council.

(1)

(A) There is established within the Office of the Director of Central Intelligence the National Intelligence Council (hereafter in this section referred to as the "Council"). The Council shall be composed of senior analysts within the intelligence community and substantive experts from the public and private sector, who shall be appointed by, report to, and serve at the pleasure of, the Director of Central Intelligence.

(B) The Director shall prescribe appropriate security requirements for personnel appointed from the private sector as a condition of service on the Council, or as contractors of the Council or employees of such contractors, to ensure the protection of intelligence sources and methods while avoiding, wherever possible, unduly intrusive requirements which the Director considers to be unnecessary for this purpose.

(2) The Council shall—

(A) produce national intelligence estimates for the Government, including, whenever the Council considers appropriate, alternative views held by elements of the intelligence community;

(B) evaluate community-wide collection and production of intelligence by the intelligence community and the requirements and resources of such collection and production; and

(C) otherwise assist the Director in carrying out the responsibilities described in subsection (a) of this section.

(3) Within their respective areas of expertise and under the direction of the Director, the members of the Council shall constitute the senior intelligence advisers of the intelligence community for purposes of representing the views of the intelligence community within the Government.

(4) Subject to the direction and control of the Director of Central Intelligence, the Council may carry out its responsibilities under this subsection by contract, including contracts for substantive experts necessary to assist the Council with particular assessments under this subsection.

(5) The Director shall make available to the Council such staff as may be necessary to permit the Council to carry out its responsibilities under this subsection and shall take appropriate measures to ensure that the Council and its staff satisfy the needs of policymaking officials and other consumers of intelligence. The Council shall also be readily accessible to policymaking officials and other appropriate individuals not otherwise associated with the intelligence community.

(6) The heads of elements within the intelligence community shall, as appropriate, furnish such support to the Council, including the preparation of intelligence analyses, as may be required by the Director.

(c) Head of intelligence community. In the Director's capacity as head of the intelligence community, the Director shall—

(1) facilitate the development of an annual budget for intelligence and intelligence-related activities of the United States by—

(A) developing and presenting to the President an annual budget for the National Foreign Intelligence Program; and

(B) participating in the development by the Secretary of Defense of the annual budgets for the Joint Military Intelligence Program and the Tactical Intelligence and Related Activities Program;

(2) establish the requirements and priorities to govern the collection of national intelligence by elements of the intelligence community;

(3) approve collection requirements, determine collection priorities, and resolve conflicts in collection priorities levied on national collection assets, except as otherwise agreed with the Secretary of Defense pursuant to the direction of the President;

(4) promote and evaluate the utility of national intelligence to consumers within the Government;

(5) eliminate waste and unnecessary duplication within the intelligence community;

(6) protect intelligence sources and methods from unauthorized disclosure; and

(7) perform such other functions as the President or the National Security Council may direct.

(d) Head of Central Intelligence Agency. In the Director's capacity as head of the Central Intelligence Agency, the Director shall—

(1) collect intelligence through human sources and by other appropriate means, except that the Agency shall have no police, subpoena, or law enforcement powers or internal security functions;

(2) provide overall direction for the collection of national intelligence through human sources by elements of the intelligence community authorized to undertake such collection

and, in coordination with other agencies of the Government which are authorized to undertake such collection, ensure that the most effective use is made of resources and that the risks to the United States and those involved in such collection are minimized;

(3) correlate and evaluate intelligence related to the national security and provide appropriate dissemination of such intelligence;

(4) perform such additional services as are of common concern to the elements of the intelligence community, which services the Director of Central Intelligence determines can be more efficiently accomplished centrally; and

(5) perform such other functions and duties related to intelligence affecting the national security as the President or the National Security Council may direct.

## Sec. 403-4.
## Authorities of Director of Central Intelligence

(a) Access to intelligence. To the extent recommended by the National Security Council and approved by the President, the Director of Central Intelligence shall have access to all intelligence related to the national security which is collected by any department, agency, or other entity of the United States.

(b) Approval of budgets. The Director of Central Intelligence shall provide guidance to elements of the intelligence community for the preparation of their annual budgets and shall approve such budgets before their incorporation in the National Foreign Intelligence Program.

(c) Role of DCI in reprogramming. No funds made available under the National Foreign Intelligence Program may be reprogrammed

by any element of the intelligence community without the prior approval of the Director of Central Intelligence except in accordance with procedures issued by the Director. The Secretary of Defense shall consult with the Director of Central Intelligence before reprogramming funds made available under the Joint Military Intelligence Program.

(d) Transfer of funds or personnel within National Foreign Intelligence Program.

(1) In addition to any other authorities available under law for such purposes, the Director of Central Intelligence, with the approval of the Director of the Office of Management and Budget, may transfer funds appropriated for a program within the National Foreign Intelligence Program to another such program and, in accordance with procedures to be developed by the Director and the heads of affected departments and agencies, may transfer personnel authorized for an element of the intelligence community to another such element for periods up to a year.

(2) A transfer of funds or personnel may be made under this subsection only if—

(A) the funds or personnel are being transferred to an activity that is a higher priority intelligence activity;

(B) the need for funds or personnel for such activity is based on unforeseen requirements;

(C) the transfer does not involve a transfer of funds to the Reserve for Contingencies of the Central Intelligence Agency;

(D) the transfer does not involve a transfer of funds or personnel from the Federal Bureau of Investigation; and

(E) the Secretary or head of the department which contains the affected element or elements of the intelligence community does not object to such transfer.

(3) Funds transferred under this subsection shall remain available for the same period as the appropriations account to which transferred.

(4) Any transfer of funds under this subsection shall be carried out in accordance with existing procedures applicable to reprogramming notifications for the appropriate congressional committees. Any proposed transfer for which notice is given to the appropriate congressional committees shall be accompanied by a report explaining the nature of the proposed transfer and how it satisfies the requirements of this subsection. In addition, the Select Committee on Intelligence of the Senate and the Permanent Select Committee on Intelligence of the House of Representatives shall be promptly notified of any transfer of funds made pursuant to this subsection in any case in which the transfer would not have otherwise required reprogramming notification under procedures in effect as of October 24, 1992.

(5) The Director shall promptly submit to the Select Committee on Intelligence of the Senate and to the Permanent Select Committee on Intelligence of the House of Representatives and, in the case of the transfer of personnel to or from the Department of Defense, the Committee on Armed Services of the Senate and the Committee on National Security of the House of Representatives, a report on any transfer of personnel made pursuant to this subsection. The Director shall include in any such report an explanation of the nature of the transfer and how it satisfies the requirements of this subsection.

(e) Coordination with foreign governments. Under the direction of the National Security Council and in a manner consistent with section 3927 of title 22, the Director shall coordinate the relationships between elements of the intelligence community and the intelligence or security services of foreign governments on all matters involving intelligence related to the national security or involving intelligence acquired through clandestine means.

(f) Use of personnel. The Director shall, in coordination with the heads of departments and agencies with elements in the intelligence community, institute policies and programs within the intelligence community—

(1) to provide for the rotation of personnel between the elements of the intelligence community, where appropriate, and to make such rotated service a factor to be considered for promotion to senior positions; and

(2) to consolidate, wherever possible, personnel, administrative, and security programs to reduce the overall costs of these activities within the intelligence community.

(g) Termination of employment of CIA employees. Notwithstanding the provisions of any other law, the Director may, in the Director's discretion, terminate the employment of any officer or employee of the Central Intelligence Agency whenever the Director shall deem such termination necessary or advisable in the interests of the United States. Any such termination shall not affect the right of the officer or employee terminated to seek or accept employment in any other department or agency of the Government if declared eligible for such employment by the Office of Personnel Management.

## Sec. 403-5.
## Responsibilities of Secretary of Defense pertaining to National Foreign Intelligence Program

(a) In general. The Secretary of Defense, in consultation with the Director of Central Intelligence, shall—

(1) ensure that the budgets of the elements of the intelligence community within the Department of Defense are adequate to satisfy the overall intelligence needs of the Department of Defense, including the needs of the chairman of the Joint Chiefs of Staff and the commanders of the unified and specified commands and, wherever such elements are performing governmentwide functions, the needs of other departments and agencies;

(2) ensure appropriate implementation of the policies and resource decisions of the Director of Central Intelligence by elements of the Department of Defense within the National Foreign Intelligence Program;

(3) ensure that the tactical intelligence activities of the Department of Defense complement and are compatible with intelligence activities under the National Foreign Intelligence Program;

(4) ensure that the elements of the intelligence community within the Department of Defense are responsive and timely with respect to satisfying the needs of operational military forces;

(5) eliminate waste and unnecessary duplication among the intelligence activities of the Department of Defense; and

(6) ensure that intelligence activities of the Department of Defense are conducted jointly where appropriate.

(b) Responsibility for performance of specific functions. Consistent with sections 403-3 and 403-4 of this title, the Secretary of Defense shall ensure—

(1) through the National Security Agency (except as otherwise directed by the President or the National Security Council), the continued operation of an effective unified organization for the conduct of signals intelligence activities and shall ensure that the product is disseminated in a timely manner to authorized recipients;

(2) through the National Imagery and Mapping Agency (except as otherwise directed by the President or the National Security Council), with appropriate representation from the intelligence community, the continued operation of an effective unified organization within the Department of Defense—

(A) for carrying out tasking of imagery collection;

(B) for the coordination of imagery processing and exploitation activities;

(C) for ensuring the dissemination of imagery in a timely manner to authorized recipients; and

(D) notwithstanding any other provision of law, for—

(i) prescribing technical architecture and standards related to imagery intelligence and geospatial information and ensuring compliance with such architecture and standards; and

(ii) developing and fielding systems of common concern related to imagery intelligence and geospatial information;

(3) through the National Reconnaissance Office (except as otherwise directed by the President or the National Security

Council), the continued operation of an effective unified organization for the research and development, acquisition, and operation of overhead reconnaissance systems necessary to satisfy the requirements of all elements of the intelligence community;

(4) through the Defense Intelligence Agency (except as otherwise directed by the President or the National Security Council), the continued operation of an effective unified system within the Department of Defense for the production of timely, objective military and military-related intelligence, based upon all sources available to the intelligence community, and shall ensure the appropriate dissemination of such intelligence to authorized recipients;

(5) through the Defense Intelligence Agency (except as otherwise directed by the President or the National Security Council), effective management of Department of Defense human intelligence activities, including defense attaches; and

(6) that the military departments maintain sufficient capabilities to collect and produce intelligence to meet—

(A) the requirements of the Director of Central Intelligence;

(B) the requirements of the Secretary of Defense or the Chairman of the Joint Chiefs of Staff;

(C) the requirements of the unified and specified combatant commands and of joint operations; and

(D) the specialized requirements of the military departments for intelligence necessary to support tactical commanders, military planners, the research and development process, the acquisition of military equipment, and training and doctrine.

(c) Use of elements of Department of Defense. The Secretary of Defense, in carrying out the functions described in this section, may use such elements of the Department of Defense as may be appropriate for the execution of those functions, in addition to, or in lieu of, the elements identified in this section.

(d) Annual evaluation of the Director of Central Intelligence. The Director of Central Intelligence, in consultation with the Secretary of Defense and the Chairman of the Joint Chiefs of Staff, shall submit each year to the Committee on Foreign Intelligence of the National Security Council and the appropriate congressional committees (as defined in section 404d(c) of this title) an evaluation of the performance and the responsiveness of the National Security Agency, the National Reconnaissance Office, and the National Imagery and Mapping Agency in meeting their national missions.

## Sec. 403-5a.
## Assistance to United States law enforcement agencies

(a) Authority to provide assistance. Subject to subsection (b) of this section, elements of the intelligence community may, upon the request of a United States law enforcement agency, collect information outside the United States about individuals who are not United States persons. Such elements may collect such information notwithstanding that the law enforcement agency intends to use the information collected for purposes of a law enforcement investigation or counterintelligence investigation.

(b) Limitation on assistance by elements of Department of Defense.

(1) With respect to elements within the Department of Defense, the authority in subsection (a) of this section applies only to the following:

(A) The National Security Agency.

(B) The National Reconnaissance Office.

(C) The National Imagery and Mapping Agency.

(D) The Defense Intelligence Agency.

(2) Assistance provided under this section by elements of the Department of Defense may not include the direct participation of a member of the Army, Navy, Air Force, or Marine Corps in an arrest or similar activity.

(3) Assistance may not be provided under this section by an element of the Department of Defense if the provision of such assistance will adversely affect the military preparedness of the United States.

(4) The Secretary of Defense shall prescribe regulations governing the exercise of authority under this section by elements of the Department of Defense, including regulations relating to the protection of sources and methods in the exercise of such authority.

(c) Definitions. For purposes of subsection (a) of this section:

(1) The term "United States law enforcement agency" means any department or agency of the Federal Government that the Attorney General designates as law enforcement agency for purposes of this section.

(2) The term "United States person" means the following:

(A) A United States citizen.

(B) An alien known by the intelligence agency concerned to be a permanent resident alien.

(C) An unincorporated association substantially composed of United States citizens or permanent resident aliens.

(D) A corporation incorporated in the United States, except for a corporation directed and controlled by a foreign government or governments.

## Sec. 403-6.
## Appointment of officials responsible for intelligence-related activities

(a) Concurrence of DCI in certain appointments.

(1) In the event of a vacancy in a position referred to in paragraph (2), the Secretary of Defense shall obtain the concurrence of the Director of Central Intelligence before recommending to the President an individual for appointment to the position. If the Director does not concur in the recommendation, the Secretary may make the recommendation to the President without the Director's concurrence, but shall include in the recommendation a statement that the Director does not concur in the recommendation.

(2) Paragraph (1) applies to the following positions:

(A) The Director of the National Security Agency.

(B) The Director of the National Reconnaissance Office.

(C) The Director of the National Imagery and Mapping Agency.

(b) Consultation with DCI in certain appointments.

(1) In the event of a vacancy in a position referred to in paragraph (2), the head of the department or agency having juris-

diction over the position shall consult with the Director of Central Intelligence before appointing an individual to fill the vacancy or recommending to the President an individual to be nominated to fill the vacancy.

(2) Paragraph (1) applies to the following positions:

(A) The Director of the Defense Intelligence Agency.

(B) The Assistant Secretary of State for Intelligence and Research.

(C) The Director of the Office of Nonproliferation and National Security of the Department of Energy.

(3) In the event of a vacancy in the position of the Assistant Director, National Security Division of the Federal Bureau of Investigation, the Director of the Federal Bureau of Investigation shall provide timely notice to the Director of Central Intelligence of the recommendation of the Director of the Federal Bureau of Investigation of an individual to fill the position in order that the Director of Central Intelligence may consult with the Director of the Federal Bureau of Investigation before the Attorney General appoints an individual to fill the vacancy.

# Executive Order 12333—United States Intelligence, December 4, 1981

## 1.4 The Intelligence Community.

The agencies within the Intelligence Community shall, in accordance with applicable United States law and with the other provisions of this Order, conduct intelligence activities necessary for the conduct of foreign relations and the protection of the national security of the United States, including:

(a) Collection of information needed by the President, the National Security Council, the Secretaries of State and Defense, and other Executive Branch officials for the performance of their duties and responsibilities;

(b) Production and dissemination of intelligence;

(c) Collection of information concerning, and the conduct of activities to protect against, intelligence activities directed against the United States, international terrorist and international narcotics activities, and other hostile activities directed against the United States by foreign powers, organizations, persons, and their agents;

(d) Special activities;

(e) Administrative and support activities within the United States and abroad necessary for the performance of authorized activities; and (f) Such other intelligence activities as the President may direct from time to time.

## 1.5 Director of Central Intelligence.

In order to discharge the duties and responsibilities prescribed by law, the Director of Central Intelligence shall be responsible directly to the President and the NSC and shall:

(a) Act as the primary adviser to the President and the NSC on national foreign intelligence and provide the President and other officials in the Executive Branch with national foreign intelligence;

(b) Develop such objectives and guidance for the Intelligence Community as will enhance capabilities for responding to expected future needs for national foreign intelligence;

(c) Promote the development and maintenance of services of common concern by designated intelligence organizations on behalf of the Intelligence Community;

(d) Ensure implementation of special activities;

(e) Formulate policies concerning foreign intelligence and counterintelligence arrangements with foreign governments, coordinate foreign intelligence and counterintelligence relationships between agencies of the Intelligence Community and the intelligence or internal security services of foreign governments, and establish procedures governing the conduct of liaison by any department or agency with such services on narcotics activities;

(f) Participate in the development of procedures approved by the Attorney General governing criminal narcotics intelligence activities abroad to ensure that these activities are consistent with foreign intelligence programs;

(g) Ensure the establishment by the Intelligence Community of common security and access standards for managing and handling foreign intelligence systems, information, and products;

(h) Ensure that programs are developed which protect intelligence sources, methods, and analytical procedures;

(i) Establish uniform criteria for the determination of relative priorities for the transmission of critical national foreign intelligence, and advise the Secretary of Defense concerning the communications requirements of the Intelligence Community for the transmission of such intelligence;

(j) Establish appropriate staffs, committees, or other advisory groups to assist in the execution of the Director's responsibilities;

(k) Have full responsibility for production and dissemination of national foreign intelligence, and authority to levy analytic tasks on departmental intelligence production organizations, in consultation with those organizations, ensuring that appropriate mechanisms for competitive analysis are developed so that diverse points of view are considered fully and differences of judgment within the Intelligence Community are brought to the attention of national policymakers;

(l) Ensure the timely exploitation and dissemination of data gathered by national foreign intelligence collection means, and ensure that the resulting intelligence is disseminated immediately to appropriate government entities and military commands;

(m) Establish mechanisms which translate national foreign intelligence objectives and priorities approved by the NSC into specific guidance for the Intelligence Community, resolve conflicts in tasking priority, provide to departments and agencies having information collection capabilities that are not part of the National Foreign Intelligence Program advisory tasking concerning collection of national foreign intelligence, and provide for the development of plans and arrangements for transfer of required collection tasking authority to the Secretary of Defense when directed by the President;

(n) Develop, with the advice of the program managers and departments and agencies concerned, the consolidated National Foreign Intelligence Program budget, and present it to the President and the Congress;

(o) Review and approve all requests for reprogramming National Foreign Intelligence Program funds, in accordance with guidelines established by the Office of Management and Budget;

(p) Monitor National Foreign Intelligence Program implementation, and, as necessary, conduct program and performance audits and evaluations;

(q) Together with the Secretary of Defense, ensure that there is no unnecessary overlap between national foreign intelligence programs and Department of Defense intelligence programs consistent with the requirement to develop competitive analysis, and provide to and obtain from the Secretary of Defense all information necessary for this purpose;

(r) In accordance with law and relevant procedures approved by the Attorney General under this Order, give the heads of the departments and agencies access to all intelligence, developed by the CIA or the staff elements of the Director of Central Intelligence, relevant to the national intelligence needs of the departments and agencies; and

(s) Facilitate the use of national foreign intelligence products by Congress in a secure manner.

## 1.11 The Department of Defense.

The Secretary of Defense shall:

(a) Collect national foreign intelligence and be responsive to collection tasking by the Director of Central Intelligence;

(b) Collect, produce and disseminate military and military-related foreign intelligence and counterintelligence as required for execution of the Secretary's responsibilities;

(c) Conduct programs and missions necessary to fulfill national, departmental and tactical foreign intelligence requirements;

(d) Conduct counterintelligence activities in support of Department of Defense components outside the United States in coordination with the CIA, and within the United States in coordination with the FBI pursuant to procedures agreed upon by the Secretary of Defense and the Attorney General;

(e) Conduct, as the executive agent of the United States Government, signals intelligence and communications security activities, except as otherwise directed by the NSC;

(f) Provide for the timely transmission of critical intelligence, as defined by the Director of Central Intelligence, within the United States Government;

(g) Carry out or contract for research, development and procurement of technical systems and devices relating to authorized intelligence functions;

(h) Protect the security of Department of Defense installations, activities, property, information, and employees by appropriate means, including such investigations of applicants, employees, contractors, and other persons with similar associations with the Department of Defense as are necessary;

(i) Establish and maintain military intelligence relationships and military intelligence exchange programs with selected cooperative foreign defense establishments and international organizations, and ensure that such relationships and programs are in accordance with policies formulated by the Director of Central Intelligence;

(j) Direct, operate, control and provide fiscal management for the National Security Agency and for defense and military intelligence and national reconnaissance entities; and

(k) Conduct such administrative and technical support activities within and outside the United States as are necessary to

perform the functions described in sections (a) through (j) above.

## 1.12 Intelligence Components Utilized by the Secretary of Defense.

In carrying out the responsibilities assigned in section 1.11, the Secretary of Defense is authorized to utilize the following:

(a) Defense Intelligence Agency, whose responsibilities shall include;

(1) Collection, production, or, through tasking and coordination, provision of military and military-related intelligence for the Secretary of Defense, the Joint Chiefs of Staff, other Defense components, and, as appropriate, non-Defense agencies;

(2) Collection and provision of military intelligence for national foreign intelligence and counterintelligence products;

(3) Coordination of all Department of Defense intelligence collection requirements;

(4) Management of the Defense Attache system; and (5) Provision of foreign intelligence and counterintelligence staff support as directed by the Joint Chiefs of Staff.

(b) National Security Agency, whose responsibilities shall include:

(1) Establishment and operation of an effective unified organization for signals intelligence activities, except for the delegation of operational control over certain operations that are conducted through other elements of the Intelligence Community. No other department or agency

may engage in signals intelligence activities except pursuant to a delegation by the Secretary of Defense;

(2) Control of signals intelligence collection and processing activities, including assignment of resources to an appropriate agent for such periods and tasks as required for the direct support of military commanders;

(3) Collection of signals intelligence information for national foreign intelligence purposes in accordance with guidance from the Director of Central Intelligence;

(4) Processing of signals intelligence data for national foreign intelligence purposes in accordance with guidance from the Director of Central Intelligence;

(5) Dissemination of signals intelligence information for national foreign intelligence purposes to authorized elements of the Government, including the military services, in accordance with guidance from the Director of Central Intelligence;

(6) Collection, processing and dissemination of signals intelligence information for counterintelligence purposes;

(7) Provision of signals intelligence support for the conduct of military operations in accordance with tasking, priorities, and standards of timeliness assigned by the Secretary of Defense. If provision of such support requires use of national collection systems, these systems will be tasked within existing guidance from the Director of Central Intelligence;

(8) Executing the responsibilities of the Secretary of Defense as executive agent for the communications security of the United States Government;

(9) Conduct of research and development to meet the needs of the United States for signals intelligence and communications security;

(10) Protection of the security of its installations, activities, property, information, and employees by appropriate means, including such investigations of applicants, employees, contractors, and other persons with similar associations with the NSA as are necessary;

(11) Prescribing, within its field of authorized operations, security regulations covering operating practices, including the transmission, handling and distribution of signals intelligence and communications security material within and among the elements under control of the Director of the NSA, and exercising the necessary supervisory control to ensure compliance with the regulations;

(12) Conduct of foreign cryptologic liaison relationships, with liaison for intelligence purposes conducted in accordance with policies formulated by the Director of Central Intelligence; and (13) Conduct of such administrative and technical support activities within and outside the United States as are necessary to perform the functions described in sections (1) through (12) above, including procurement.

(c) Offices for the collection of specialized intelligence through reconnaissance programs, whose responsibilities shall include:

(1) Carrying out consolidated reconnaissance programs for specialized intelligence;

(2) Responding to tasking in accordance with procedures established by the Director of Central Intelligence; and

(3) Delegating authority to the various departments and agencies for research, development, procurement, and operation of designated means of collection.

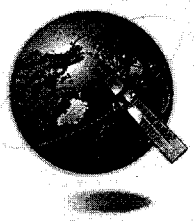
(d) The foreign intelligence and counterintelligence elements of the Army, Navy, Air Force, and Marine Corps, whose responsibilities shall include:

(1) Collection, production and dissemination of military and military-related foreign intelligence and counterintelligence, and information on the foreign aspects of narcotics production and trafficking. When collection is conducted in response to national foreign intelligence requirements, it will be conducted in accordance with guidance from the Director of Central Intelligence. Collection of national foreign intelligence, not otherwise obtainable, outside the United States shall be coordinated with the CIA, and such collection within the United States shall be coordinated with the FBI;

(2) Conduct of counterintelligence activities outside the United States in coordination with the CIA, and within the United States in coordination with the FBI; and

(3) Monitoring of the development, procurement and management of tactical intelligence systems and equipment and conducting related research, development, and test and evaluation activities.

(e) Other offices within the Department of Defense appropriate for conduct of the intelligence missions and responsibilities assigned to the Secretary of Defense. If such other offices are used for intelligence purposes, the provisions of Part 2 of this Order shall apply to those offices when used for those purposes.



# APPENDIX J
# GLOSSARY OF ACRONYMS

| | |
|---|---|
| **ADCI/C** | Assistant Director of Central Intelligence for Collection |
| **ASAF/Space** | Assistant Secretary of the Air Force for Space (NRO Director) |
| **CFI** | Committee on Foreign Intelligence |
| **CIA** | Central Intelligence Agency |
| **CMO** | Central MASINT Organization |
| **COMMS** | NRO Communications Directorate |
| **DARO** | Defense Airborne Reconnaissance Office |
| **DCI** | Director of Central Intelligence |
| **DDCI** | Deputy Director of Central Intelligence |
| **DDCI/CM** | Deputy Director of Central Intelligence for Community Management |
| **DDMS** | NRO's Deputy Director for Military Support |
| **DDNS** | NRO's Deputy Director for National Support |
| **DIA** | Defense Intelligence Agency |
| **DoD** | Department of Defense |
| **DRSP** | Defense Reconnaissance Support Program |
| **DSPO** | Defense Support Project Office |
| **DSRP** | Defense Space Reconnaissance Program |

| | |
|---|---|
| **DS&T** | CIA's Directorate of Science and Technology |
| **EELV** | Evolved Expendable Launch Vehicle |
| **EXCOM** | Executive Committee |
| **FIA** | Future Imagery Architecture |
| **HPSCI** | House Permanent Select Committee on Intelligence |
| **HUMINT** | Human Intelligence |
| **IC** | Intelligence Community |
| **ICBM** | Intercontinental Ballistic Missile |
| **IMINT** | Imagery Intelligence |
| **IOSA** | Integrated Overhead Signals Intelligence Architecture |
| **JMIP** | Joint Military Intelligence Program |
| **JROC** | Joint Requirements Oversight Council |
| **MASINT** | Measurement and Signature Intelligence |
| **MIND** | FIA's Mission Integration and Development Element |
| **NASA** | National Aeronautical and Space Agency |
| **NFIP** | National Foreign Intelligence Program |
| **NIMA** | National Imagery and Mapping Agency |
| **NRO** | National Reconnaissance Office |
| **NRP** | National Reconnaissance Program |
| **NSA** | National Security Agency |
| **NSC** | National Security Council |

| | |
|---|---|
| **NSCID** | National Security Council Intelligence Directive |
| **OD&E** | CIA's Office of Development and Engineering |
| **OSR** | Office of Space Reconnaissance |
| **PDD** | Presidential Decision Directive |
| **RD&A** | Research, Development and Acquisition |
| **SAFSP** | Secretary of the Air Force Office of Special Programs |
| **SBIRS** | Space-Based Infrared System |
| **SIGINT** | Signals Intelligence |
| **SSCI** | Senate Select Committee on Intelligence |
| **SWARF** | Senior Warfighters Forum |
| **TIARA** | Tactical Intelligence and Related Activities |
| **TPED** | Tasking, Processing, Exploitation, and Dissemination |
| **USIB** | United States Intelligence Board |



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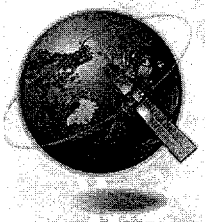

# APPENDIX K
# COMMISSION STAFF

| | |
|---|---|
| **Kenneth F. Colucci** | Chief of Staff |
| **Arthur V. Grant** | Executive Director |
| **Americo R. Cinquegrana** | Chief Review Counsel |
| **Daniel J. Gallington** | Chief Counsel |
| **Andrew M. Langenbach** | Executive Officer |
| **Rodney P. Liesveld** | Professional Staff |
| **Robert R. Odell** | Professional Staff |
| **Jeanne W. Purdon** | Security Officer |
| **Doreen G. Romero** | Administrative Staff |
| **Bernard C. Victory** | Professional Staff |

# The Information Edge:

## Imagery Intelligence and Geospatial Information in an Evolving National Security Environment

Report of the Independent Commission on the National Imagery and Mapping Agency

December 2000
Final Report

# Foreword

Last year, the Congress requested that an independent commission be formed to review the National Imagery and Mapping Agency, or NIMA. This report documents the commission's finding and recommendations, some of which need to be addressed by the defense and intelligence leadership, and others by NIMA.

This is a commission of which I am proud. For almost ten months, our nine commissioners, richly experienced and with a set of diverse perspectives drawn from government and industry, worked hard to understand NIMA, including its management and organizations, technology development and acquisition strategies, and its business practices. They focused intensely on NIMA's large and diverse customer base, to understand where NIMA is performing well and where it might perform better. Finally, the commission endeavored to analyze and understand NIMA's future, whether to critically assess the current vision, or to suggest other paths that might be more wisely taken.

We had the benefit of considerable input along the way. Thousands of written documents, hours of briefings, and the attention of many senior Department of Defense and Intelligence Community officials provided candid inputs for our consideration. A diverse set of industry participants gave us a look at current technology and management practices and how NIMA might take advantage of these to best do their mission. Various Commissioners visited Denver, St. Louis, Tampa, and Omaha, and to NIMA representatives supporting U.S. forces in the United Kingdom, Germany, and Italy.

This Commission represents the most recent inquiry into NIMA, one which followed a Defense Science Board study covering many of the same topics. The Commission tried to build on previous studies and where appropriate expand on some of the ideas.

NIMA's mission is complex and daunting. Strong leadership support from both Intelligence and Defense as well as timely implementation of the enclosed recommendations is essential if NIMA is to meet the needs of the national security community in the coming years.

Peter Marino
Chairman

# Executive Summary and Key Judgments

Late in the fall of 1999, Congress requested the Director of Central Intelligence (DCI) and the Secretary of Defense (SECDEF) to form a Commission to review the National Imagery and Mapping Agency (NIMA), a new agency perceived by some to be struggling toward coherency as the national security environment and US doctrine—*e.g.*, *Joint Vision 2010*—evolved mercilessly around it. A proximal event was the disappointing realization that design and acquisition of the Future Imagery Architecture (FIA) had sorely neglected the value-adding systems and processes known collectively as "TPED"—the tasking, processing, exploitation and dissemination of the imagery collected by reconnaissance satellites.

The Commission, formed early in 2000 to review key dimensions of strategy and performance of NIMA, has completed its work and offers a number of conclusions and a few recommendations. Several supporting studies were performed by RAND and will be made available in their entirety to the Director of NIMA. The Commission also had the benefit of a number of prior studies, including one recently published by the Defense Science Board. Few of the issues that arose in the course of the investigation were unexpected; most had been previewed by the earlier reports.

The Commission validates the charge that the Intelligence Community is "collection centric," thinking first of developing and operating sophisticated technical collection systems such as reconnaissance satellites, and only as an afterthought preparing to properly task the systems and to process, exploit, and disseminate the collected products.

The Commission concludes that, although some progress has been made, the promise of converging mapping with imagery exploitation into a unified geospatial information service is yet to be realized, and NIMA continues to experience "legacy" problems, both in systems and in staff. Admittedly, these problems are not of NIMA's making—it inherited two disparate cultures, an expanding mission, and inadequate resources. Notwithstanding, the Commission believes that timely development of a robust geospatial information "system" (GIS) is critical to achieving national security objectives in the 21st century. The Director of

NIMA understands this and the Commission has every expectation that he will fulfill the promise, circumstances permitting.

The Commission observes the traditional short tenure of senior-most leadership among Combat Support Agencies and is concerned that, with a nominal tour length of two to three years, the current vision and momentum may not endure sufficiently to become institutionalized. The senior-most NIMA leadership garners high marks, but some NIMA management strata are of uneven quality.

The Commission finds NIMA attempting to modernize all systems simultaneously—anticipating the FIA—with high-caliber systems engineering and acquisition personnel in dangerously short supply both in NIMA and in the Intelligence Community at large, which is simultaneously trying to modernize signals intelligence (SIGINT) and bring next-generation reconnaissance satellites online.

The Commission questions whether US military doctrine has evolved to so rely on intelligence—imagery, especially—that it may become unsupportable with current investments. The need to precisely engage—with strategic considerations—any and every tactical target, without collateral damage, without risk to American lives, requires exquisite knowledge immediately prior to, and immediately subsequent to, any strike. Demonstrably, US imagery intelligence cannot support this activity on any meaningful scale without precarious neglect of essential, longer-range issues without additional resources.

The Commission noted occasional competition for intelligence resources between the Department of Defense (DOD) and non-DOD users of intelligence that borders on the unhealthy. Positive leadership must be exerted jointly and sincerely by SECDEF, the Joint Chiefs, and the DCI, who must first reconcile any differences between and among themselves. NIMA, itself, must be more attuned to impending imbalances.

The Commission learned that in a comprehensive requirements review that helped define FIA, considerable imaging requirements were allocated to commercial and airborne imagery: In peacetime, less than 50% of required area coverage is allocated to FIA, while commercial

and airborne assets accounted for the majority of peacetime area allocations. For peacetime point coverage the reverse is true, with the bulk of peacetime point targets allocated to FIA, and a minority to airborne and commercial assets. During a major theater conflict, about half of both area and point coverage, are allocated to FIA, while commercial and airborne assets combine to meet the other half of all requirements.

FIA holds to the claim that it will meet all its allocations; however, because of negligible budgeting to date for commercial imagery, and proposed reductions in airborne investment, OPSTEMPO and PERSTEMPO—the FIA era still might not live up to its billing as eliminating collection scarcity. Compounding the problem, the Commission could find no credible plans—*i.e.*, adequately funded program—to integrate commercial and airborne products into FIA and/or TPED.

The Commission echoes the sentiments of Congress with respect to the halting way in which the Intelligence Community is embracing commercial imagery collection—processing and exploitation, as well. In retrospect, inadequate notice was taken of the potential availability of high-quality commercial imagery as a part of the larger FIA architecture. In the spirit of Presidential Decision Directive (PDD) 23, the Commission is inclined to endorse the US-industry move to resolutions of 0.5 meters, the capabilities of which should be fully and aggressively incorporated into a serious plan that would, *inter alia*, remove the current fiscal disincentives that discourage end-users from opting for commercial imagery when it can otherwise meet their needs.

The Commission applauds NIMA's outsourcing of products—largely cartographic, to date—and agrees that considerably more may be warranted, including value-added geospatial products, selected imagery analysis products, and specialized, "science-based" imagery exploitation. Indeed, the Commission wonders whether the time may be right to consider externalizing the operation of almost all legacy systems and legacy products, consistent with assured continuity of service and provision for crisis capacity. The benefits would include freeing up scarce-skilled US government (USG) personnel and relief from the strain on the management attention span of NIMA and the Intelligence Community.

The Commission asked hard questions about key aspects of imagery-TPED. Is the design for TPED adequately understood? Is new thinking being incorporated aggressively and balanced with sound management of technical risk? Are users' future needs well enough understood and provided for? Does the TPED design accelerate the integration of imagery and geospatial concepts—the promise, after all, of creating NIMA? Is the TPED approach grounded in modern information systems thinking? And, is there a plan for rapid insertion of new technology? Is NIMA, with its current staffing, capable of managing the acquisition of TPED? Is the likely cost of TPED fully reflected in current budgets? The Commission acknowledges the herculean task of modernizing while under resourced and simultaneously attempting to satisfy the increasing demand for its staple products.

The Commission found reason to be concerned about the level of research and development conducted by and on behalf of NIMA. Imagery and geospatial activities in the national security sector are only partially congruent with those of interest to the commercial information technology sector. The Commission is convinced that woefully inadequate R&D holds hostage the future success of TPED, the US Imagery and Geospatial Service (USIGS), and indeed of US information superiority. Nor does the Commission see sufficient, aggressive, and effective regard by NIMA for the issues of technology insertion.

The Commission feels that US loss of satellite imagery exclusivity makes a robust imagery-TPED absolutely critical, but does not see this urgency reflected in the programming and budgeting for TPED. By way of explanation or excuse, critics have recited their litany of NIMA-TPED ills. While the Commission agrees with some of the criticisms, it fails to see how that situation can be improved by under funding.

Finally, the Commission suggests that the US loss of satellite imagery exclusivity places a hefty premium on SIGINT-IMINT convergence—sooner rather than later—but questions whether the "multi-INT TPED" is being given adequate priority. The Commission cautions, however, that actually integrating Imagery- and SIGINT-TPED is a bigger, more costly, more demanding job than the sum of the two respective pieces done separately. Staffing such an enterprise in a traditional government way seems, to the Commission, to be a nearly insuperable hurdle.

The Commission offers a number of recommendations of which the most global and far-reaching are summarized here. Where possible the recommendations suggest that specific actions, with specific outcomes and set time frames, be assigned to particular officials.

The Commission recommends that the DCI and SECDEF, with such help from Congress as may be required, ensure that the Director of the National Imagery and Mapping Agency (D/NIMA) serve a term of not less than five years, absent cause for dismissal, and subject to the personal needs of the individual. In the event that an active duty military officer serves as Director, the cognizant military service must commit to this length of tour and Congress should ameliorate any unique hardship that this entails upon the military service.

The Commission recommends creation in NIMA of an Extraordinary Program Office (EPO) armed with special authorities of the Director of Central Intelligence and the Secretary of Defense, augmented by Congress and staffed—free of staff ceilings and pay caps—through an heroic partnership between industry, NIMA, and the National Reconnaissance Office (NRO). The EPO, to be constituted from the best national talent, shall be charged with, and resourced for all pre-acquisition activities, systems engineering and architecture, and acquisition of TPED—from end-to-end, from "national" to "tactical." The first milestone shall be completion of a comprehensive, understandable, modern-day "architecture" for TPED. Other provisions of law notwithstanding, the Congress shall empower the Director of the EPO to commingle any and all funds duly authorized and appropriated for the purpose of the "TPED enterprise," as defined jointly by the Secretary of Defense and the Director of Central Intelligence.

With some trepidation—anxious not to delay further NIMA's TPED program—the Commission suggests concomitant study of the evolving TPED strategies on the part of commercial imagery vendors and value-added GIS providers. While the timing may not be right, the opportunity to converge on what may become the commercial mainstream should not be overlooked.

The Director of NIMA—with the Defense Information Systems Agency (DISA) and the managements of Intelink and OSIS—shall ensure promptly that commercial imagery and value-added suppliers are able to pursue an "e-business" model for their products. Budget

submissions for the National Foreign Intelligence Program (NFIP), Joint Military Intelligence Program (JMIP) and Tactical Intelligence and Related Activities (TIARA) budget submissions should realistically reflect needed resources for an aggressive program of "open source" imagery acquisition, which shall be sufficiently robust, stable, and predictable as to encourage US commercial interests. The Secretary of Defense should establish a central source of funds against which components can charge commercial imagery purchases.

The Commission recommends that the DCI and Assistant Secretary of Defense for Command, Control, and Communications (ASD[C3I]) request, and the Congress approve, a substantial increase in research and development by and on behalf of NIMA—in aggregate, an amount more in keeping with the proportionality of cutting-edge industries in the information business. And, to take advantage of this sponsored research, as well as to reap the benefits of the commercial information technology revolution—which fortunately shows no signs of abating—the Director of NIMA shall implement a vigorous technology insertion process. Receptivity to technology insertion should be reinforced in the NIMA workforce and become an incentivized Key Performance Parameter (KPP) of all USIGS system acquisitions; test-beds and Advanced (Concept) Technology Demonstrations (ATD/ACTD) should be used more widely. Consideration should be given to naming a Chief Technology Officer.

Finally, and more broadly, the Commission suggests that serious, far-reaching review is required of evolving US military doctrine and its dependence on an ever-expanding definition of information superiority, so as to determine the contingent liabilities placed on intelligence. These and these alone must define the needed level of investment in intelligence resources by the military services. Anything less is reckless and irresponsible. We cannot simply design intelligence capabilities to cost; we must design-to-cost the overall strategy which consumes intelligence.

### Findings of the Commission

NIMA is an essential component of US national security and a key to information dominance. Despite some shortcomings it is a vital, if under-appreciated, organization staffed with talented individuals and led by dedicated officers.

Despite its acknowledged criticality to information dominance, NIMA is under-resourced overall, not only for TPED acquisition (USIGS modernization), but also for commercial imagery procurement, R&D, and training for its officers and for the larger imagery and geospatial community.

NIMA works hard at understanding its customers and, by and large, is quite successful at it. In the field, NIMA receives praise up and down the line. Washington-area customers, too, compliment NIMA but evince concerns about the future insofar as today's relatively happy state of affairs is based on personal relationships and long-term expertise; the concern is that as the present cohort retires the situation could deteriorate.

The tension between the "strategic" (long-term) challenges and the "operational" (short-term) challenges is a larger national security community problem. It most definitely is not the fault of NIMA, despite perceptions of some all-source analysts and their managers that NIMA tilts toward operational military needs at their expense. In fact, the tension itself is more properly characterized as one of balancing long term and short-term intelligence support to a wide range of customers.

D/NIMA appreciates the need to bolster long-term imagery analysis and plans to transfer 300 NIMA positions (60 per year, 2001-2005) from cartography to imagery analysis, all of whom would remain in the Washington, DC, area to support Washington customers and rebuild NIMA's long-term analysis capability.

Having DCI versus the SECDEF as the ultimate tasking authority, in the absence of major hostilities, still makes sense; it continues to ensure that the delicate balance between military and diplomatic intelligence needs is maintained in the face of everyday contentions for national imagery collection resources. The principles of DCI tasking authority, and provision for its transfer to the Secretary of Defense in time of war, have served the nation well. The DCI is purposefully positioned to appreciate national, military, and civil claims against a scarce imagery resource and to adjudicate otherwise irreconcilable contentions as may arise among the constituencies. His role here is not accidental, but by design.

The relatively new positions of Assistant Director of Central Intelligence for Analysis and Production, and for Collection (ADCI/AP and ADCI/C) could benefit NIMA considerably

by prioritizing the information needs of the national consumers and the reflection of those needs on the collection disciplines, especially imagery. They chair Intelligence Community fora for achieving consensus, the National Intelligence Production Board (NIPB), and the National Intelligence Collection Board (NICB), respectively.

"TPED"[1] is critical for sustaining US information dominance, but there are doubts that the design for TPED is adequately articulated or understood; that the incorporation of new thinking is pursued aggressively yet balanced with sound management of technical risk; that users' future needs are well understood and provided for; or that the TPED design accelerates the integration of imagery and geospatial concepts—the promise, after all, of creating NIMA.

Continuing to organize its business model around legacy products and processes puts NIMA at risk in the FIA era, shortchanges the needs and priorities of users, and fails to facilitate convergence of imagery analysis and geospatial production.

Multi-INT TPED is vital to retaining US information dominance, but progress on converging even IMINT and SIGINT is halting at best. The recent announcement about cooperation on shared requirements databases is a step in the right direction. Against all odds, there is compelling evidence that NIMA should be in the forefront of this convergence because it owns the geospatial construct.

There is a justifiable lack of confidence in NIMA's current ability to successfully accomplish its acquisition of TPED (by whatever name)—reminiscent of the lack of systems engineering and acquisition capabilities of its forebears. The current TPED (or, USIGS modernization) acquisition effort lacks a clear baseline, which should tie closely to overall strategy, requirements, and cost constraints. Heroic measures will be required to remedy the problems. D/NIMA could well benefit from an advisory panel to help, in the first instance, with TPED acquisition.

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[1] Here we mean to include both imagery and geospatial "TPEDs". When necessary, the term "imagery TPED" is used. Generally, TPED and USIGS can be relatively interchangeable. The reader is referred to the discussion of what TPED is and what USIGS is.

There is accumulating evidence that the likely cost of TPED (or USIGS modernization) is not accurately reflected—*i.e.*, is significantly underestimated—in the current POM/IPOM. Supporters and detractors alike recognize that the NIMA infrastructure is not up to the present mission, much less the future, and that the full value of FIA cannot be realized unless major improvements are made.

The lines of responsibility between TPED and communications systems, both terrestrial and space, have been blurred. The dialogue so far among NIMA, DISA, NRO, and the user community engenders no confidence that the links will be there when needed. The CINCs and Services conveniently profess not to know where TPED ends.

D/NIMA's position is very difficult—he tries to serve two masters, tries to harness two cultures, is under-resourced, driven by technology, and he is forced to run the organization at the tactical as well as strategic level because of uneven management strength in some of his direct reports. The middle management corps is the key to NIMA success in merging cultures, in modernizing, and in outsourcing.

The current tour length of the Director of NIMA, two to three years, is too short to solidify accomplishments, institutionalize solutions, and sustain the momentum for needed change; it allows the Director's intent to be frustrated by recidivists who wait out the change in leadership.

The FIA requirements process expressed considerable demand for commercial imagery, and there is considerable additional latent demand in the field, both of which are seriously attenuated by the fact that national technical means (NTM) appears to be a free good, while buying commercial imagery means trading off against beans and boots and bullets. NIMA's commercial imagery strategy is lackluster and the larger US strategy to commercialize remote sensing is as yet unrealized due largely to the Intelligence Community's and DOD's reticence.

While the US has not been aggressive enough in approving commercial imagery licenses, the National Security Council (NSC) is to be applauded on its recent decision to approve a 0.5-meter commercial imagery license.

There is evidence of cultural and bureaucratic impediments to outsourcing NIMA products, but there are some in NIMA intent on getting the in-house/outsourced balance correct. Lacking, however, is a well-thought-out overall strategy for what might be called "transformational" outsourcing *vice* using contractors as a "body shop" supplement to a government workforce.

Not yet taking maximum advantage of commercial hardware and software, NIMA appears to depend heavily upon existing processes and products and persists in developing government standards that diverge from emerging commercial standards. Nor is NIMA properly positioned to make good use of an e-business model, which would allow for online order taking and order fulfillment, peer-to-peer and business-to-business transactions, and "point-of-sale" financial transactions.

The documented decline in experience and expertise in its imagery analyst corps jeopardizes NIMA's ability to support its customers. Not limited to NIMA, the downturn in analytical expertise is due to both loss of experienced people and the fewer number of years of experience held by the new hires.

SES/SIS positions in NIMA hover around 1 percent; this is puny, even in comparison to the USG average of 2.5 percent and quite a bit lower than sister intelligence agencies.

Inheriting no R&D legacy from its predecessor organizations, NIMA, today, has too little R&D investment and no overall strategy; it could benefit from a Chief Technology Officer. NIMA is not well positioned for rapid and continual technology insertion and does not make use of Advanced Concept Technology Demonstrations (ACTD).

When NIMA does choose to rely on contractors, its acquisition and contracting practices come in for heavy criticism even from successful bidders. If NIMA is to take full advantage of commercial offerings, it must be seen as a steadfast partner.

The sooner NIMA forsakes legacy products in favor of data sets from which the products—legacy and new—can be constructed by consumers downstream, the better.

D/NIMA does not fully assert his role as functional imagery manager, has too little say over end-to-end architecture (including the "last tactical mile"), and too little leverage over *all* intelligence and defense imagery-related investment.

# 1. Introduction

NIMA's history has been brief, but the Agency has been scrutinized repeatedly by Inspectors General, Defense Science Board Task Forces, and congressional fact finders, *inter alia.* With all the best intentions, the oversight has been time-consuming and each successive review has rediscovered the blindingly obvious. This is not to say that each did not add value to the work of its predecessors, but only to point out the law of diminishing returns.

The Director of NIMA was extremely helpful to the present NIMA Commission. Not in so many words, but D/NIMA did let on that he hoped this NIMA Commission would become known, not only as a fount of insights but also as "The *Last* NIMA Commission," at least for a while.

## 1.1 Commission Creation

The Classified Annex to the FY 2000 Department of Defense Appropriations Conference Bill established an independent Commission to review the National Imagery and Mapping Agency (NIMA). The Secretary of Defense (SECDEF) and the Director of Central Intelligence (DCI), through the Assistant Secretary of Command, Control, Communications, and Intelligence (ASD[C3I]) and the Deputy Director of Central Intelligence for Community Management (DDCI/CM), respectively, appointed members to the Commission. RAND's National Defense Research Institute—a federally funded research and development center (FFRDC)—was chosen to provide the Executive Secretary and other staff for the Commission.

The Commission's charge was to look broadly at NIMA, across the spectrum of management, system development and acquisition, imagery and communications technologies, and organizational development.

## 1.2 Specific Commission Tasks

The Commission was charged to conduct a comprehensive review of NIMA's present organizational and management structures, current technology development and acquisition

plans, business practices, and operational support services provided to the Defense Department and the Intelligence Community. The review was to include, but not be limited to, the following issues and questions:

- ✓ A review of the management challenges at NIMA;
- ✓ The most effective future course for NIMA's strategic technology development and acquisition programs;
- ✓ The prospect and the efficacy of greater use of commercial sources for imagery collection and exploitation, geospatial information, and storage and retrieval of data and information;
- ✓ The efficiency of NIMA business practices;
- ✓ An assessment of acquisition experience and system integration experience of the NIMA workforce;
- ✓ The sufficiency of current requirements forecasts and cost estimates for USIGS (the US Imagery and Geospatial Service(s)/System) to include an assessment of the adequacy of the budgetary resources devoted to USIGS over the current five-year defense plan (FYDP); and,
- ✓ An investigation of a nettlesome issue generally referred to as "national versus tactical," which the Commission found to be a misnomer.

### 1.3 Makeup of the Commission

Peter Marino, **Chairman**

Nancy E. Bone, **Commissioner**

Jack Dangermond, **Commissioner**

R. Evans Hineman, **Commissioner**

James V. Hirsch, **Commissioner**

Robert King, **Commissioner**

C. Lawrence Meador, **Commissioner**

Keith Rhodes, **Commissioner**

LTG Sidney ("Tom") Weinstein, (USA ret),
**Commissioner**

Kevin O'Connell, **Executive Secretary**

Dr. Joseph Markowitz, **Senior Consultant**

Steve Comer, **CMS Liaison**

Capt. Steve Monson, USN, **C3I Liaison**

Rahul Gupta, **Commission Staff**

Dana Johnson, **Commission Staff**

Charles Kelley, **Commission Staff**

Martin Libicki, **Commission Staff**

Julie Jones, **Executive Officer**

John Ivicic, **Security Officer**

### 1.4 Commission Methodology

As might be expected, the Commission met frequently in plenary sessions where it heard briefings from current and former Executive Branch officials from defense and intelligence organizations, congressional staff present at the creation of NIMA, and representatives from the commercial sector. The majority of the information was gleaned from NIMA officers, who were exceptionally responsive, and from NIMA's customers—military and non-military, operational and intelligence organizations, and other civil (non-defense) organizations—who all were unsparing of their time to help the Commission in its work.

In the course of its deliberations, the Commission journeyed beyond Washington as and when necessary, most often to meet with NIMA's consumers on their home ground and to visit commercial and industrial partners.

The Commission, as commissions often do, found it useful to organize itself into working groups for the purposes of digging deeper into particular issues and making most efficient use of the diverse expertise represented on the Commission. The working groups were

> **TPED Working Group—**reviewed the logic of TPED, its current state, and its acquisition management. Its first challenge was defining TPED—or USIGS modernization—and understanding its scope. Another challenge was to understand whether the program to replace IDEX-II imagery workstations had run aground, and if so, why. An emphasis on architecture and multi-INT issues rounded out its program.

**Management Working Group**—considered, *inter alia*, the respective roles of the DCI and SECDEF, the authorities and responsibilities of the Director of NIMA, and a variety of workforce issues.

**Commercial Working Group**—focused on the entire spectrum of "commercial" issues:

- ✓ Commercial Imagery—its potential economies and ability to unburden USG collection systems, as well as its potential both to contribute to US information superiority and to diminish US information superiority;
- ✓ Commercial Sources—the issues that surround outsourcing of products and services;
- ✓ COTS—the degree to which NIMA can take advantage of commercial "off-the-shelf" technology in its systems; and,
- ✓ "Commercialization"—the change in business processes that might embrace *e*-commerce practices and allow those who consume the imagery capacity to be better informed as to the cost of the resources they consume—*i.e.*, turn the "consumers" into "customers."

**Clean Sheet Working Group**—spawned a "Clean Sheet Working Group" to investigate what NIMA would look like if reinvented free from its legacy information systems. The Working Group chose to focus on NIMA's information architecture largely because of the business that NIMA is in. But there was an important secondary reason. NIMA is about to embark on a major TPED acquisition initiative, which will, for better or worse, define its information architecture for a decade or two to come.

## 1.5 A Review of Previous Studies of NIMA

There have been a number of insightful studies of NIMA, of which the Commission took full advantage. At least nine studies of NIMA, some classified, some not, have been

conducted in the last few years. Some of these studies had a very specific focus, while others took a broader review of NIMA, as has this Commission.

The preparation of this report prompted us to review some of the major themes that emerged in those efforts and how they relate to our own. **Virtually every one of these studies envision NIMA as a smaller, elite, and mission-driven organization in the future. They also envision an important role for NIMA in US information dominance, derived both from imagery and geospatial information.** Prominent among the earlier studies and again addressed here are the following themes:

- The need to strengthen NIMA's role as the functional manager for imagery and geospatial information
- The need to develop NIMA's workforce, especially in the areas of systems engineering, acquisition, and imagery analysis
- The need for better planning and communication with regard to tasking, processing, exploitation, and dissemination (TPED)
- The need to take strong advantage of an emerging commercial sector, and focus government resources on providing unique capabilities
- NIMA's challenges in technology planning and acquisition, especially in the area of TPED, and
- The need for agile, integrated tasking and other capabilities across satellite, airborne, and commercial sources of imagery.

The Commission has two observations related to these recommendations and the challenges inherent in them:

First, while NIMA's transformation is still incomplete, and progress against some of the goals mixed, the Commission observes progress in virtually every area. For example, while the Commission has a number of comments and recommendations about NIMA's acquisition and technology issues, we do find demonstrable progress across the period of these studies in the NIMA Acquisition and Technology Directorate. Second, and in light of our own recommendations, the Commission suggests that it is time to let NIMA get on with implementing the recommendations made by this and prior panels. The continued study of NIMA drains resources from those staff who must interact with task forces, and from those who must implement what is an increasingly clear set of issues required for NIMA's transition to a more effective agency.

### 1.6 Support to the Commission

The Commission had the full support of the Community Management Staff (CMS)—including the personal help of the Hon. Ms. Joan Dempsey, the Hon. James Simon, and the ASD(C3I)—again, including the personal support of the Hon. Art Money, and Capt. Steve Monson, USN.

NIMA itself provided immeasurable support, starting with the personal attention of General King, Director of NIMA, without whom the report would not be the same. His staff and management team were equally unstinting in their support.

The Commission was ably aided by RAND's National Defense Research Institute, which studiously recorded critical items of information from the briefings and researched special topics for the Commissioners. The special studies included:

**Commercial Imagery Policy:** This study assessed the overall state of progress within the United States on imagery commercialization, including an assessment of input factors to the second-generation licenses under National Security Council consideration during the Commission's tenure. The study analyzed NIMA's Commercial Imagery Strategy in light of this situation, and made recommendations about its future course.

**"National Versus Tactical" Issues:** This classified study assessed the US imagery collection strategy in an area of high contention for collection resources, in order to understand whether there is an imbalance between strategic targets and tactical targets. This study also included a number of analytic experiments designed to look at how changes in collection strategy–such as changes in collection priority, platform, or sensor—would impact overall collection volume as well as collection against strategic and tactical targets in the given area.

**Outsourcing:** This study looked at NIMA's strategic vision and the role of outsourcing within it. It assessed the tensions between NIMA's attempts to modernize (partially) through outsourcing and more traditional perspectives on production both at NIMA and within the NIMA customer base. It mapped the role of outsourcing–and the mechanisms to implement it–from NIMA's strategic plan and business plans through its outsourcing strategy and outsourcing processes. The study also analyzed the effectiveness of NIMA's outsourcing processes in the areas of mission support and geospatial products, including the "make-or-buy" decisions associated with them.

**TPED Acquisition:** This study examined the acquisition strategies being used by NIMA to acquire the hardware, software, and other equipment needed to support the agency's role in tasking, processing, exploitation, and dissemination (TPED). It looked at the dominant characteristics of NIMA acquisitions–such as the emphasis on commercial-off-the-shelf (COTS) technology, use of open architecture, and the level of integration challenge–the dependent factors for NIMA's acquisition strategy, and an assessment of three systems that NIMA is presently acquiring in light of those factors.

RAND also provided tailored support to the Commission's Working Groups. Among the inputs to the Commission were papers and briefings on the following topics:

**"Clean Sheet" Paper:** RAND coordinated the various inputs of the Clean Sheet Working Group into a document, entitled "An Alternative Scenario for NIMA: Strategy, Structure, Process, and Technology." Portions of this paper have been incorporated directly into this report.

**Briefing on Organizational Cultures:** This briefing for the Management Working Group identified the key internal and external factors influencing NIMA's emerging organizational culture, including the extent to which NIMA's component cultures–military, mapping, and intelligence–create challenges for current attempts to merge imagery and geospatial analysis. The study postulates three alternative futures for NIMA, including the culture/capabilities mix implications for each of them.

**Paper on Geospatial Technologies**: This paper, entitled, "The Integration of Geospatial Technology and Information into Our Everyday Lives," identified current trends in geographic information systems and other geospatial technologies, and a future vision of the geospatial marketplace. It identified the changing role of user communities, data issues, and standards as important elements of that marketplace. The NIMA Commission's Commercial Working Group was a co-sponsor of this paper, along with another RAND sponsor.

Copies of these RAND studies will be made available to the Director of NIMA. A complete list, for the record, of those individuals and organizations with whom the Commission met is available in the appendix of this document.

## 2. NIMA from the Beginning

The National Imagery and Mapping Agency (NIMA), according to its own lights, "...was established October 1, 1996, to address the expanding requirements in the areas of imagery, imagery intelligence, and geospatial information. It is a Department of Defense (DoD) combat support agency that has been assigned an important, additional statutory mission of supporting national-level policymakers and government agencies. NIMA is a member of the Intelligence Community and the single entity upon which the US government now relies to coherently manage the previously separate disciplines of imagery and mapping. By providing customers with ready access to the world's best imagery and geospatial information, NIMA provides critical support for the national decisionmaking process and contributes to the high state of operational readiness of America's military forces."[2]

NIMA was borne, not out of whole cloth, but by combining extant intelligence and defense organizations involved in imagery exploitation and mapping, charting, and geodesy—mainly, the National Photographic Interpretation Center (NPIC) and the Defense Mapping Agency (DMA).[3] The creators, *inter alia,* were the Hon. John White, then Deputy Secretary of Defense, and the Hon. John Deutch, then Director of Central Intelligence. The creation of NIMA presumed a natural convergence of the mapping and image-exploitation functions—as each become "digital"—into a single, coherent organization organized around the construct of a geospatial information system (GIS).

NIMA's creation was clouded by the natural reluctance of two cultures to merge and the fear that their respective missions—mapping in support of defense activities versus intelligence production, principally in support of the national policymaker—would be subordinated, each

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[2] http://164.214.2.59/general/faq.html.

[3] More completely, "NIMA was formed through the consolidation of the following: the Defense Mapping Agency (DMA), the Central Imagery Office (CIO), the Defense Dissemination Program Office (DDPO), and the National Photographic Interpretation Center (NPIC) as well as the imagery exploitation and dissemination elements of the Defense Intelligence Agency (DIA), the National Reconnaissance Office (NRO), the Defense Airborne Reconnaissance Office (DARO), and the Central Intelligence Agency" *ibid.*

to the other. To a large extent, a NIMA culture has yet to form, but the Commission is heartened by signs that the two legacy cultures have begun to see benefit in melding their respective disciplines to solve real intelligence problems, as exemplified in a later section.

While convergence of mapping and imagery exploitation around the organizing GIS construct still appears to make good technical sense, NIMA has yet to achieve unity, either of purpose or personnel. Even in today's new-speak, NIMA advertises itself in terms of USIGS—the US Imagery *and* Geospatial Service. The NIMA mission—to provide timely, relevant and accurate imagery, imagery intelligence, and geospatial information in support of national security objectives—shows the same multiplicity.

This is not to downplay the early challenges of merging multiple administrative, logistic, and personnel systems at different locations, while trying to communicate/collaborate over different, noninteroperable computing and communications systems.

NIMA's vision is to guarantee the "information edge" to the US national security community. Expanding on its vision, NIMA aims to have its information provide the common reference framework for planning, decisions, and action; provide ready access to databases of imagery, imagery intelligence, and geospatial information that it acquires and/or produces; use its information holdings to create tailored, customer-specific solutions, the information from which enables their customers to visualize key aspects of national security problems; and to value the expertise of its people who are critical to acquiring and/or creating the information that gives the advantage to its customers.

Suitably laudable are NIMA's core values: commitment to its customers, demonstrated pride, initiative, commitment, personal integrity, and professionalism; a culture that promotes trust, diversity, personal and professional growth, mutual respect, and open communication; an environment that rewards teamwork, partnerships, risk taking, creativity, leadership, expertise, and adaptability; and a tradition of excellence and personal accountability.

# 3. NIMA in Context

## 3.1 The National Security Context

When the Soviet Union exited the world stage left, the US national security community breathed a momentary, collective sigh of relief. The elation was, however, short-lived. Despite the clamor of the popular sentiment for a "peace dividend," the challenges to our national security, perhaps less immediately life threatening, became more numerous, more diverse, and, in some ways, more difficult.

Emerging threats notwithstanding, the United States drew down its military and intelligence capacity as it traditionally had done after resolution of each preceding conflict. The Gulf War was but a satisfying interlude to "demobilization" through which we coasted on our residual military strength and our accrued intelligence. What should have been an object lesson on the wisdom of investing in capability became, instead, the rationale for continued disinvestments because of the lopsidedness of the Gulf conflict.

There were two lessons learned, and subsequently reinforced, one by the policymakers and the public, the other by military planners.

Policymakers and the US public—having seen the vision of miraculously light American casualties and minimal collateral damage—forced "rules of engagement" to become excessively stringent (and overoptimistic). There is wishful endorsement of the kindest, gentlest, "zero-zero" warfare—zero American lives lost, zero collateral damage.

Military planners evolved *Joint Vision 2010* (now *2020*) that placed immense faith in the ability of the intelligence community to deliver on the military desire for continued information superiority, indeed, "dominance".

Consequently, a substantial "contingent liability" was levied on intelligence, at a time when intelligence capabilities were still being diminished apace. The result, to paraphrase a

popular motion picture, is that political and military thinkers are writing checks that the Intelligence Community cannot cash!

In 2020,[4] the nation will face a wide range of interests, opportunities, and challenges. This will require diplomacy that can effectively advance US interests while making war a less-likely last resort, a military that can both win wars and contribute to peace, and an intelligence apparatus that can support both. The global interests and responsibilities of the United States will endure, and there is no indication that threats to those interests and responsibilities, or to our allies, will disappear.

Three aspects of the world of 2020 have significant implications for our statecraft, our Armed Forces, and the Intelligence Community that underpins both. First, the United States will continue to have global interests and be engaged with a variety of regional actors. Transportation, communications, and information technology will continue to evolve and foster expanded economic ties and awareness of international events. Our security and economic interests, as well as our political values, will provide the impetus for engagement with international partners. For the engagement to be successful, no matter the playing field or the opponent's rules, our commercial and diplomatic "forces" must be fully informed and constitutionally prepared to prevail short of war, while our military must be prepared to "win" across the full range of military operations in any part of the world, to operate with multinational forces, and to coordinate military operations, as necessary, with government agencies and international organizations.

Second, potential adversaries will have access to the global commercial industrial base and much of the same technology as the United States. We will not necessarily sustain a wide technological advantage over our adversaries in all areas. Increased availability of commercial satellites, digital communications, and the public Internet all give adversaries new capabilities at a relatively low cost. We should not expect opponents in 2020 to engage with strictly "industrial age" tools—information-age tools will be the key to our effectiveness.

Third, we should expect potential adversaries to adapt as our capabilities evolve. We have superior conventional warfighting capabilities and effective nuclear deterrence today, but this favorable military balance is not static. We have the best intelligence and most fully informed statecraft. In the face of such strong capabilities, the appeal of asymmetric approaches and the focus on the development of niche capabilities by potential adversaries will increase. By developing and using approaches that avoid US strengths and exploit potential vulnerabilities using significantly different methods of operation, adversaries will attempt to create conditions that frustrate our US diplomatic, economic, and military capabilities.

The potential of such asymmetric approaches is perhaps the most serious danger the United States faces in the immediate future—and this danger includes long-range ballistic missiles and other direct threats to US citizens and territory. The asymmetric methods and objectives of an adversary are often far more important than the relative technological imbalance, and the psychological impact of an attack might far outweigh the actual physical damage inflicted. An adversary may pursue an asymmetric advantage on the tactical, operational, or strategic level by identifying key vulnerabilities and devising asymmetric concepts and capabilities to strike or exploit them. To complicate matters, our adversaries may pursue a combination of asymmetries, or the United States may face a number of adversaries who, in combination, create an asymmetric threat. These asymmetric threats are dynamic and subject to change, and the United States must maintain the capabilities necessary to successfully anticipate, deter, defend against, and defeat any adversary who chooses such an approach. To meet the challenges of the strategic environment in 2020, our diplomacy and our military must be able to achieve full spectrum dominance.

### 3.2 The Collection Context—FIA

The Commission observes that the FIA-era increase in imagery of more than an order of magnitude does not, in and of itself, imply a need for a proportionate increase in exploitation capacity. Some increase may be needed, but an *N*-fold increase in imagery does not

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[4] This section paraphrases and elaborates upon the "Strategic Context" of *Joint Vision 2020.*

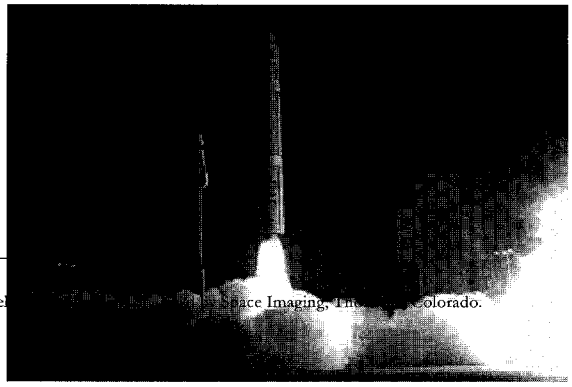
necessarily translate into an *N*-fold increase in information content, particularly when the additional imagery capacity is used to more frequently "sample" the same target for activity analysis, or indications and warning (I&W). Watching grass grow does not take a lot of exploitation.

The Commission notes, elsewhere, that there are outstanding requirements, endorsed by the Joint Chiefs of Staff (JCS) and not satisfied by FIA as currently baselined. Among these, military users of imagery, especially the US Army, argue for the importance of direct theater downlink (TDL). Of course, the argument goes beyond just the "downlink" of imagery, which is effectively accomplished with only minimal delay, today, *via* communications satellites. Rather, the argument is, a regional commander should be "apportioned" the space reconnaissance assets as they are in view of his theater of operations. However, National technical means, FIA included, have not been designed, heretofore, to accommodate this requirement. To modify the electro-optical imaging design would substantially reduce the available imaging time over theater as the satellite traded off imaging operations for communications operations.

The Commission notes, in passing, that at least one of the commercial satellites[5] is actually a TDL design. Its tasking instructions and deposit of imagery are done by "regional operations centers" (ROCs), and inasmuch as the commercial vendor is anxious to sell "imaging minutes on orbit" the US military could experiment, today, with this concept, and "pay by the minute"—*i.e.*, without capital investment or long-lead programming and budgeting. Cryptographic provisions to guarantee theater privacy are already in place.

### 3.3 Commercial Imagery

On September 24, 1999, Space Imaging successfully "launched" the world's first



[5] IKONOS, the newest imaging satel[illegible]pace Imaging, [illegible]olorado.

commercial one-meter imaging satellite, IKONOS. The US government was a positive factor in this endeavor, despite some national security reservations, and Presidential Decision Directive 23 codified US policy on foreign access to remote sensing capabilities. Space Imaging was granted a license that permitted it to sell commercial imagery at a resolution of one meter, among others.

While the importance of resolution is often overstated, improved resolution clearly allows new information to be extracted from an image. As imagery resolution moves from the ten of meters to one meter and below, military applications move beyond terrain analysis, through gross targeting, to precision targeting, bomb damage assessment, order-of-battle assessment, to technical intelligence findings.

The Commission endorses the move to allow US companies to move to higher resolution a required by the competition and demanded by the marketplace. It will demonstrate continued technical superiority and signal US government intent to keep US companies in the forefront. It will raise the bar, discourage others, and impose new barriers to entry. More importantly it will open up new markets for satellite imagery now the exclusive province of airborne photography. And the vastly improved, immediately visible resolution characteristics will substantially improve "eye appeal," capturing the imagination of the public, and especially the imagination of those from whom the new applications will flow. The vitality produced by this change cannot be overstated—this energy will fuel the next generation of NIMA-relevant COTS technology.

Until recently, NIMA has been a captive customer for satellite imagery provided by the National Reconnaissance Office (NRO), whose *raison d'etre* is building and operating satellites, pure and simple. Because of government internal accounting practices (planning, programming, and budgeting) the NRO has a capital budget to build satellites that is loosely derived from requirements that NIMA voices on behalf of its consumers.[6] Once the satellites are built and launched, there is no attempt to recover sunk costs. Even operating costs for the imaging constellation, ground processing, and exploitation are not recovered.

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[6] "Consumers," not "customers," because, as we shall see, they do not "pay" for products in the conventional sense—no unseen hand of Adam Smith operating here!

Imagery acquired from US "National technical means" is a free good.[7] However, use of commercial imagery either by NIMA or by its consumers directly is not a free good; operating budgets must accommodate any imagery purchases from Space Imaging and/or its competitors. In a sense, notes the Commission, commercial imagery providers face competition from an established behemoth with deep pockets that gives away its wares.

The US government, Defense and Intelligence, and/or NIMA have not requested that the Congress appropriate substantial funds for commercial imagery. Notwithstanding, the Congress has successively appropriated "extra" monies for NIMA to purchase commercial imagery (and, presumably, value-added imagery products). The Commission is disappointed that NIMA has been slow to articulate a commercial imagery strategy that Defense and Intelligence would endorse. The Commission is more distressed by an announcement promising $1 billion for commercial imagery purchase, which has subsequently proved to be so much fiction.

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[7] But, because it is free and (therefore) heavily oversubscribed, it is rationed by an elaborate, dynamic prioritization scheme that is accused by some of being politicized as well as cumbersome.

# 4. Two-and-a-Half Roles for NIMA

Below we describe two missions and a supporting function: intelligence production, geospatial information provision, and acquisition agent, respectively. We distinguish between the two missions, each of which NIMA has to do, and acquisition, which could be done for NIMA although the Commission does not endorse distancing acquisition in this way.

The Commission distinguishes the mission of intelligence from that of geospatial information by noting that in the former case, the analyst tries to go beyond the data, while in the latter, the GIS specialist tries to portray the data with scrupulous accuracy.

## 4.1 NIMA as an Intelligence Producer

NIMA inherits a proud tradition of imagery analysis from its forebears, especially the National Photographic Interpretation Center (NPIC). We can trace the modern era of national imagery collection to the U2, its successor the SR-71, and the earliest film-return satellites. Each was a technical marvel in its own right: the U2, an airplane that could fly so high that no then-available missile or pursuit plane could reach it; the SR-71, an airplane that could fly so fast that none could catch it; and satellites still further out of reach, aloft for years, which ejected exposed film cassettes to be snagged in midair by a plane that would deliver it to the classified "drugstore" to be developed. Equally marvelous was the exploitation industry that grew up to service these reconnaissance assets, especially NPIC—generations of dedicated men and women at light tables continuously developing their art and improving their craft.

The information gleaned from national imagery has informed (and transformed) US policy and operations—it has, indeed, assured the safety of the republic. To successfully "read out" the story an image has to tell requires both technical and substantive experience. Recounting that story in a convincing way to the uninitiated requires additional expository and illustration skills. Not all imagery interpreters/analysts have all skills honed to the same degree. Indeed, one can distinguish between photo interpreters (PIs) and imagery analysts

(IAs), the latter, some would say, being the higher calling. By whatever name, however, IAs and PI's historically have seen themselves as distinct from geographers and cartographers—the stuff of a Geospatial Information Service (GIS). Moreover, the business processes that consume imagery intelligence are distinguishable from those that consume GIS data.

There is absolutely no expectation that NIMA's role as an imagery intelligence producer will decline. If anything, because of the travails of the US SIGINT system—going deaf, some would say—the role of imagery intelligence will be still more important.

### 4.2 NIMA as a GIS Provider

An equally proud tradition, which NIMA inherited from the Defense Mapping Agency and its predecessors, is the provision of maps and charts to the Defense Department and beyond. The mission of mapping, charting, and geodesy (MC&G) has been, and continues to be, critical to the national security community. NIMA produces over one hundred standard "map" products. These remain in high demand. Indeed, despite the digital revolution, NIMA is distributing more paper products than ever. Notwithstanding, the mission has evolved rapidly, apace with information technology, and now we speak more broadly of a Geographic Information Service/System.

The skills of the geographer and cartographer need to be honed every bit as finely as those of the imagery analyst (IA) or photo interpreter (PI). But, they have not traditionally been fungible. The Commission forecasts the broader construct of GIS will come to embrace both and foster a convergence of skill sets.

Despite some encouraging experiments with collocation of the two disciplines, and encouraging examples such as that recounted below in *Tale of Two Cities*, the Commission has looked largely in vain for real convergence. Interestingly, it found some, not in Washington or St. Louis, but in-theater, closest to military operations, where "topographic engineers" are creating fused products. Both US Army intelligence doctrine as well as US army engineer doctrine should explicitly articulate how the terrain analysts should work with imagery and intelligence analysts throughout the force, as well as how the larger "topo" battalions relate to NIMA.

### 4.3 The Role of Acquisition in NIMA

NIMA is in the information business. Therefore, NIMA requires information systems to execute its core missions of producing imagery intelligence and providing GIS information. However, the acquisition of those systems need not be considered a core business of NIMA. Another, responsive, organization could well be the procurement agent for NIMA systems. This has a certain appeal.

NIMA's forebears, by and large, did not do systems acquisitions: DMA and NPIC both required (and received) outside help for their major systems procurements. Consequently, NIMA has neither the tradition nor the organic assets to conduct major systems engineering and acquisition activities. It is trying to build such a cadre. However, the going is slow, and the competition for information-systems skills fierce. Moreover, building a cadre of systems engineering and acquisition skills inevitably comes at the expense of the core skills of imagery intelligence and GIS. There is internal competition for slots and grades, and more important for upper-management attention.

The Commission wrestled with the question of how intimate to NIMA must be the systems acquisition and acquisition activities. The Commission sought external alternatives but found none satisfactory—none skilled with the "excess" capacity to take on the NIMA workload. Grudgingly, the Commission concludes that NIMA must, itself, acquire the skills to acquire. However, the Commission recommends that NIMA do this in a manner highly unusual for government, and the reader is directed to those sections of the report that discuss and recommend formation of an "Extraordinary Program Office" (EPO).

# 5. The Promise of NIMA

Most who have tried to reconstruct the logic that put NPIC and DMA together into the National Imagery and Mapping Agency have concluded that it was the potential, profitable convergence of imagery and geospatial processes and products. And, while it is but a few years since the inception of NIMA, it is disturbing, nonetheless, that convergence has not occurred more rapidly and more completely. There remains the cultural divide between the Imagery Analysts (IAs) and the geospatial analysts (geographers and cartographers, by another name.) Is it merely human nature to resist such change, or perhaps that the presumed competition between the two groups or functions would inevitably produce winners and losers? Or, is there something more fundamental, some logic that would keep separate the two functions? Have we just failed thus far to find the unifying theme(s)?

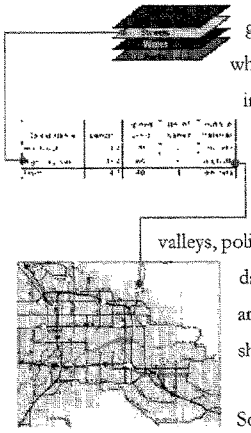
Belief in the convergence of imagery and mapping is not limited to this side of the Atlantic. Less than a year ago it was announced in British Parliament that the Defense Geographic and Imagery Intelligence Agency (DGIA) would be formed by merging JARIC and Military Survey—respectively, the NPIC and DMA of the UK. Each, of course, has its own history and culture: JARIC dates from the Second World War, while Military Survey recently celebrated its 250th anniversary. The logic of the merger was that

> *[benefits] will come as digital technology allows the work of the agencies to be increasingly integrated in future, including the production, storage and handling of similar sorts of data.... It is not just increasingly common sources of data and developing digital processes that are pulling the two agencies together. There is also an increasing requirement for the agencies' outputs to contribute to a common intelligence picture required by their defense 'customers'...*[8]

## 5.1 Convergence of Imagery and Geospatial Processes

Imagery and geospatial activities, now housed in one organization, NIMA, *vice* two—NPIC and DMA—continue to elude one another to a large extent. Putatively, the vision behind the amalgamation of the two organizations was the emerging construct of geospatial

(digital) data that could intellectually encompass imagery and imagery analysis. This is vexing to some, while reinforcing the biases of others. Still, it is time to question the fundamentals of the assimilation argument.



A digital dataset of geospatial consequence has certain characteristics. Each "record" contains coordinates that relate it to a point, line, surface or volume about the geosphere. For most items, there is strong data typing, wherein the respective data types (or features) relate to interesting human activities and permit interesting operators to work on the items.

The dataset may include rivers and marshes, mountains and valleys, political jurisdictions, and the road to grandmother's house. The dataset can be displayed as a "map" with which we can facilitate any number of human activities. Each "record" in the dataset should also be "time-tagged" as well as geospatially referenced.



So, is an image such a dataset? Or, is it such a datum? A picture of grandmother can be geospatially referenced so that it can be viewed by clicking on grandmother's house's location on the map. How about a reconnaissance image, perhaps one from which the map was "made"—*i.e.*, one from which the digital dataset was extracted. It, too, can be geospatially referenced and accessed via the "map," but is it more than that?

From a GIS perspective, this discussion is reminiscent of arguments about the natural superiority of raster-over digital datasets, or the reverse. To the simplistic map user, the map is "the thing" and the digital dataset is a necessary evil, about which the less heard the better. To the GIS advocate, the digital dataset is "truth" and the map is just a view of the dataset, rendered, usually, by "rastering." However, the image from which the digital dataset features may have been extracted (*i.e.*, from which the map was made) cannot be "created" (or even

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[8] (UK) Select Committee on Defense *Fifth Report—THE DEFENCE GEOGRAPHIC AND IMAGERY INTELLIGENCE AGENCY.*

"recreated") by a rendering (rasterized or otherwise) of the digital GIS dataset.[9]

In a totally uninteresting sense, of course, the image—as it was erected on the focal plane of the reconnaissance satellite—was pixilated and digitized by the CCD array and captured as a two-dimensional array of numbers, which incidentally are of most interest to a rastering display device. Sufficient meta-data are captured and associated with the image to describe the "camera model," the time of acquisition, the ephemeris data of the collection vehicle, and the pointing angle—that, together with information about the earth's rotation—can translate into geocoordinates of the image (and its pixels.) As a database element, an image is rather unremarkable.

However, an image is something that eons of tinkering with the human hardware and software have allowed us to collect and interpret (task, process and exploit) "with the naked eye." Consequently, an image has a primary place in our consciousness. We can relate to an image in precortical ways that we cannot relate to a map. On the other hand, over those same eons, we have acquired the capability to extract features from an image and render it so as to be able to communicate (disseminate) it to others. We have also acquired the capacity to compile geospatial datasets not only from images but from our own wanderings and from words about the wanderings of others—simply, we have learned to sketch maps.

Finding, with the help of today's technology, easier and more useful ways of moving between images, GIS datasets, renderings, and words is the key to removing today's constraints on today's TPED. Seeking convergence between cartography and imagery analysis—and merging more closely together their respective work—is particularly promising.

The products are converging, most demonstrably in "image maps" where vector data sets--road and telecommunications networks, say—are overlaid on orthorectified imagery. The advantage of such products, *inter alia*, is that a dated vector data set can be overlaid on an up-

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[9] In a technical sense, we have lost some information when we "transformed" the image into the vector data set (but, hopefully no interesting information). Of course, working with the vector dataset we also add other

to-date image, allowing the end-user to "update" his perceptions. Another, compelling example of the power of fusing vector data with imagery is to "drape" the image (or pieces of several) over a terrain model to create the now classic "fly-throughs."

The systems, too, are converging. IEC, the replacement terminal for the IDEX soft-copy imagery analysis system, will have the vector capabilities better known to the modern cartographer as well as the imagery analysis functionality more familiar to the IAs.

There is reason to believe that imagery analysts can move to a higher plane if they have some of the arrows in the cartographer's quiver. And, of course, for NIMA, the more in tune with intelligence analysis the cartographer becomes, the more valuable to the enterprise he or she becomes.

### 5.2 What Did the Geographer Know ... and When Did He Know It?

The "electronic geographer"—*i.e.*, today's cartographer, creator of GIS datasets—exploits a satellite reconnaissance image by finding, measuring, and recording natural and cultural features of interest. This extraction of "feature sets" is highly stylized and is made measurably easier if the image is a soft-copy image and if the computer has a relatively simple toolkit that references points and clicks to the image's coordinate system—*i.e.*, georeferences the selected features—and provides a set of menu picks that embody the vocabulary of cartography—*e.g.*, unimproved roads, bridges, etc.

The cartographer is all about making accessible a set of geographic information, which can be used subsequently—generally by others as yet unspecified—to accomplish a task. The cartographer is about making a "map", by which an aviator might navigate, or a real estate developer might site a shopping center, or an armchair traveler might experience exotic places.

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information.

## 5.3 What Did the Imagery Analyst Know… and When Did She Know It?

By contrast with the geographer, the image analyst is about "storytelling"-like the legendary native scouts who could read subtle signs in the dust to recount the passage of game or interpret the activities of those who had camped there previously. In fact, however, the image analyst also "extracts features" such as the size and shape of new military construction, the extent and character of security fencing, and the direction of tank tracks through a trackless waste. Frequently, the extraction of these features is made easier for the imagery analyst by software tools that look suspiciously like those of the cartographer—and yielding deliciously similar digital data sets.

Alas, our image analyst does not generally regard the digital data set so derived as a product; it is frequently reduced to a textual description in an intelligence report. In this translation to intelligence prose, considerable information—all the bits and bytes that might support rendering a "real" picture *vice* a word picture—is lost to posterity. Worse than posterity, it is unavailable when that subject military facility is next imaged and must again be exploited, perhaps by the selfsame imagery analyst, who rereads her previous report and recreates in her mind's eye the picture.

In fact, we could capture much of the exploitation as digital datasets that would support:

- ✓ Illustrations for the intelligence report,
- ✓ Templates for smartly extracting an image "chip" for dissemination,
- ✓ Feature overlays on "imagery maps," and (thus)
- ✓ An aid to the subsequent exploitation of the next image of that target.

The technically inclined reader will note that such a derived digital dataset supports the ultimate in smart bandwidth compression. It permits faster dynamic overlays of historical images, and can more easily travel the "last tactical mile." Automatically compatible with ELINT-derived datasets, it advances us toward the holy grail of "multi-INT" TPED.

## 5.4 Convergent Systems and Convergent Products

To reiterate, a principal reason for the creation of NIMA was the recognition of the benefits of imagery and geospatial integration. The Commission has heard anecdotes of such integration (*e.g.*, specialized, tailored products for areas in the Balkans were developed), but was unable to find evidence of a strategic plan to make such cooperation routine. A recent study sponsored by the ADCI/Collection indicated that GIS tools that link diverse information to physical locations via layers could improve analysts' understanding of their intelligence problems. Such tools can also improve multi-INT analysis, if the data are presented in the proper format. In addition, use of such tools and the collaboration of analysts and collection managers can improve collection planning and efficiency.

The imagery and geospatial community is in the process of replacing its primary image-exploitation workstation, IDEX.[10] The goal was to finally move away from the light-table exploitation of film and toward soft-copy exploitation by computer. The technical challenge has always been the "need for speed." While just how big our satellite images are is classified, suffice it to say that they are Big! And they have gotten bigger just as computers have gotten faster. Simply rendering, panning, zooming, and rotating such images has remained just slightly beyond the reach of affordable desktop computers for two decades.[11] Ultimately successful, IDEX was a troubled development of custom hardware and software with display power still beyond commodity desktops. It has come to incorporate a number of powerful raster-image manipulation algorithms. It does not, however, support the more commonplace vector manipulations favored by Geospatial Information Systems (GIS). So, unfortunately, it does not promote the desired convergence of disciplines.

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[10] The roots of IDEX go back at least a quarter-century to a research effort, IDEMS, conducted by CIA's since-disbanded Office of Research and Development (ORD) on behalf of CIA's since-absorbed National Photographic Interpretation Center (NPIC). IDEX can also trace its roots to the Air Force COMPASS COPE effort at Rome Air Development Center (RADC).

[11] A lot of tricks have been tried. In the BR-90, Bunker Ramo (several times removed from TRW) married film projection with CRT technology and vector graphics. Rotating the whole CRT was also in favor briefly.

The latest-generation IDEX "replacement" is IEC. It does support the GIS operations. Good! It does not, however, quite match the custom-designed raster-image capabilities of IDEX. Bad! Unless it is modified so it does, the fingers of the hardcore imagery analysts will have to be pried from their IDEX stations. Without widespread and enthusiastic acceptance of IEC or equivalent, the promised convergence of imagery intelligence with mapping, charting, and geodesy will remain an unrealized dream.

## 5.5 A Tale of Two Cities

[*The story you are about to read is true. All the details have been changed by "security."*]

**Washington, DC**—Imagery Analysts (IAs) face the daunting task of searching a large, denied area in order to locate particular pieces of deployable military hardware. The alternative of taking high-resolution satellite imagery of the entire country and searching it, square meter by square meter, is prohibitive. Sufficient imaging capacity to do the job cannot be freed up, nor would it be feasible to image the entire country in a sufficiently short space of time to be confident that the hardware had not redeployed, hop scotch fashion, from as-yet-unimaged locations to previously imaged locations, in the interim. In any event, sufficient IA-hours are not available to conduct so brute-force a search.

**St Louis, MO**—Geospatial Analysts review the geography, topography, and cultural features—road, rail, and power networks; hills and dales, forests and clearings—correlated with previous sitings (sightings) of such equipment. A factor analysis later, the Geospatial Analysts prepare a "map" (vector dataset) that provides the template for where to search—where to image and where to exploit.

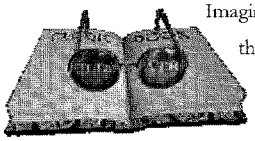
**Washington, DC**—The IAs get the picture!

But, do they really get the picture? Is this a story about IAs who "subcontract" for collateral information? Or, is this a story about the ascendance of the Geospatial Analysts who, faced with a vexing intelligence problem—"map" the locations of subject hardware—and proceed to produce said map, showing probable future- and confirmed present-sites, with workaday assistance of trained eyeballs (to be replaced, when cost-effective, by computerized pattern recognition)? Or, is this a triumph of "collaboration?" Or, does it presage the next generation of intelligence professionals, schooled in *both* imagery and geospatial analysis disciplines?

More generally, NIMA is examining the feasibility of collocating regional specialists to encourage better integration of imagery and geospatial information. The Commissioners were made aware of a planned "experiment" to integrate Latin America imagery and geospatial analysts, *i.e.*, collocate those analysts who are Latin American specialists. The Commission lauds this "experiment" but urges NIMA to include the experiment as part of the larger development of a geographic information database. Furthermore, NIMA should

set explicit goals and performance metrics to determine whether collocation and integration works, how well it works, and how it may be extrapolated to other parts of NIMA.

### 5.6 "Magic Maps"—Another Kind Of Convergence



Imagine being able to unfold a paper map and look at it "through the lens" of a computer network appliance. Suddenly the paper map would spring to life, show terrain in 3-D, show moving mobile SAMs actually moving, and see their effective threat envelope as upside down sugar loaves. And, as you moved the paper map from side to side, or rotated it, the "erected" data images would move in synchrony, allowing you to view the terrain from any perspective. Just such technology is emerging from the laboratory. Augmented or mixed reality (AR) research aims to develop technologies that allow one to mix or overlap computer generated 2-D or 3-D virtual objects on the real world. Unlike virtual reality that replaces the physical world, AR enhances the physical reality by integrating virtual objects into the physical world, which become in a sense an equal part of our natural environment.[12]

This fusion of computer-generated visualizations of vector data sets and paper maps is particularly intriguing as it may allow us, literally, to overlay new technology on legacy products. And, of course, it can be "multi-INT," fusing additional data derived from HUMINT and SIGINT. From the user's point of view, an especially appealing characteristic of such a "magic map" is its graceful degradation in the face of computer malfunction. We have augmented the map with computer-generated displays, but, if all else fails, the old standby map is as effective as it ever was. Moreover, the ability to overlay vector data onto maps in this way allows the soldier to simply mark up his map with traditional symbology without having to shift his gaze or attention away from the paper. Imagine sending an update to be marked on a map without having to use coordinates—

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[12] "The Pop-Up Book Picks Up Magical Dimensions," *New York Times*, 12 October 2000, p. E7. See also http://www.hitl.washington.edu/magicbook/.

sending, as it were, directly to the eye of the soldier who needs to annotate his map, or to the navigator or mariner who needs to update his chart.

## 6. NIMA and Its Stakeholders

NIMA is at once a Department of Defense Combat Support Agency and a member of the Intelligence Community, as is the National Security Agency (NSA). Each tries to balance its national intelligence mission with its more immediate support to the warfighter. The extent to which either can be more or less successful depends upon the degree to which its separate reporting lines—to the Director of Central Intelligence in one case, and through to the Secretary of Defense in the other—are synchronized with each other as well as with CIA, the uniformed military services and the Joint Chiefs of Staff. This is a hefty set of players to huddle around one playbook.

When such diverse players must queue up to the same bank window, it is not surprising that they try to pick each other's pockets. When there seems to be too little imagery and exploitation for the competing intelligence processes—military and nondefense, national and theater, strategic and tactical, short term and long term—it is not surprising that tensions arise.

NIMA, an unlikely marriage by some lights, and a come-lately to the game, suffers most. It may be a reasonable stratagem to allow operators in the field to treat imagery intelligence as a free good—more like oxygen[13] than ice cream—but that simply means that, at the highest levels of leadership, there must be an awareness of its true cost and value, and a willingness to cooperatively ensure that the resources are made available. Having birthed this agency, defense and intelligence leadership must commit themselves absolutely to its health and well-being. It is that important.

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[13] As with oxygen, information ought not be denied: the higher we fly, the more we need.

At the highest level, we are in for a rude awakening because the reliance on information superiority to deliver bloodless victory demands intelligence capacity, especially imagery intelligence capacity, well beyond that which current investments can provide. Defense and intelligence leadership must redress this variance and reconcile themselves and their accounts to support NIMA. This will mean resisting other pressures, the true test of leadership. Firm decisions, not just continuous deciding, are required.

To anticipate a recommendation made later in the report, the Commission believes that a new systems engineering and acquisition element should be formed and staffed with a caliber of talent not now readily found in NIMA, or in the Intelligence Community at large. In fact, the Commission refers to this creation as an "Extraordinary Program Office," by which we mean to connote a significant departure from the way US government components are usually configured. To get the talent required, the Commission suggests that the Director of Central Intelligence and the (Deputy) Secretary of Defense take a personal interest in persuading key contractors to relinquish to the government, for a defined period, a small number of their own very best personnel. With the help of Congress and the cooperation of industry, all the details of transfer and compensation can be worked out if, and only if, there is personal commitment by senior defense and intelligence leadership—leadership committed to making things, the right things, happen.

# 7. NIMA and Its "Customers"

## 7.1 Kudos from Users

The Commission found that in the field NIMA received praise up and down the line, from the Commanders-in-Chief (CINCs) to field-grade operations officers and below. Washington-area customers, too, had compliments for the NIMA service they currently receive, but they evinced concerns about the future. Much of today's relatively happy state of affairs is based on personal relationships and long-term expertise; the concern is that as the present cohort retires the situation could deteriorate.

The NIMA Commission concludes that NIMA works hard at understanding its customers and, by and large, is quite successful at it.

### 7.2 Support to CIA and DIA

When NIMA was formed, CIA and DIA imagery analysts were moved into NIMA. Although some remained assigned to components within DIA and CIA—especially in the DCI Centers—the majority of all-source analysts in CIA and DIA components "lost" their direct imagery support.

This contrasts with the military commands who retained management and operational control of their organic imagery support when NIMA was formed, and have since enjoyed the addition of NIMA IAs assigned to their command and under their operational control.

Support to CIA and DIA all-source analysis is a significant part of NIMA's mission, as D/NIMA well understands. He has made it a priority and told the Commission of his plan to transfer 300 NIMA positions (60 per year, 2001-2005) from cartography to imagery analysis, all of whom would remain in Washington, DC, to support Washington customers and rebuild NIMA's long-term analysis capability.

Despite D/NIMA's efforts to reassure DIA and CIA, some seniors at the two agencies remain concerned about the lack of long-term research in NIMA and the lack of collaborative analytic efforts between NIMA, CIA, and DIA. The Commission discussed options that might alleviate the angst of CIA and DIA and, in the end, decided there was no single, ideal model for how support to these two organizations should be structured—a variety of models, including the present one, could work given sufficient resources, expertise, and interagency cooperation and trust.

The Commission endorses the plan to fill the 300 positions (60 per year, 2001-2005, transferred from cartography) with imagery analysts and would stiffen the resolve of D/NIMA to keep them all in Washington to rebuild NIMA's long-term analysis capability and to focus on neglected national issues. To the leadership at CIA and DIA the Commission counsels patience and good communication as NIMA rebuilds its analytic cadre; all-source analysts should take the initiative to reach out to NIMA IAs.

### 7.3 Customer Readiness for Change—The Paper Chase

NIMA staff believe, correctly, that many of their customers continue to prefer using NIMA's traditional information products (*i.e.*, hard copy) rather than newer digitally based (*i.e.*, soft copy) technologies. The Commission was treated to the old saw about the trooper who draws his .45 (now, 9mm), shoots a hole in a paper map, and asks pointedly if the digital appliance, so treated, would still perform as well. This is, indeed, a cautionary tale; there is a certain durability to a paper map product. Evidence of just how durable they are (and how venerable they can be) is attested to by the palettes of dated paper maps waiting to be deployed.

The argument is not whether, *in extremis*, a soldier can depend more on a paper map. Even if paper (or maybe Kevlar) were the required medium of issue, there would still be a question as to where and when the map information should be overlaid on it---at an earlier date convenient to economy-of-scale big presses, or "just-in-time" at the edge of battle, which our trooper forgot to mention almost always seems to occur on the corners of four contiguous map sheets.

The real argument is whether the speed of change of doctrine matches the rate at which technology refreshes itself. Is this a revolution in military affairs, or slow evolution? We should rethink the reliance a soldier must have on his paper map talisman when his logistics train knows where he is and what he needs, when his vehicle knows where it is and where to go, and when his fire-and-forget weapon knows its launch site and aim point.

When doctrinal inertia demands that legacy systems and processes be kept in place at the same time as new demands are levied for new technologies and products, NIMA's problem is to fit it all in a fixed budget.

The solution is twofold.

First, legacy products should be outsourced, or otherwise fairly costed, and users of legacy products must be "cost informed" as to the resources they consume. Ideally, the valuation should be emphasized "at point of sale." One way to do this, which is generally resisted, is

to price the products and go to "industrial funding," a euphemism for charging the users—*i.e.*, turning consumers into customers.

The contrary argument, which has admitted merit, is that information/intelligence should, like oxygen, be free.[14] Otherwise, to their detriment, warriors will neglect to "buy it," just as they frequently do for training or spares. One way to resolve this apparent paradox, not surprisingly, is leadership.

Second, insofar as new demands for new-tech products result from the introduction of a new weapons system, the cost of the geospatial product to support the system should be an identifiable variable in the "total cost of ownership" of that system. It should be factored into original acquisition decisions no less than fuel costs, ammunition, training, or spares. And it should be programmed and budgeted in the same manner and with the same vigor as the system itself.

### 7.4 Turning Consumers Into Customers

The Commission observes that national technical means (NTM) imagery appears to be "free" to government agencies, while use of commercial imagery generally requires a distressingly large expenditure of (largely unplanned, unprogrammed) O&M funds. This perception of NTM imagery as a free good, not surprisingly, influences the willingness of those organizations to seriously consider purchasing commercial imagery. Two suggestions for resolving this problem have been suggested to the Commission.

The solution, which the Commission favors, is to remove cost from the user's equation. That is, to set aside a central commercial imagery fund—administered separately and immunized from "embezzlement" by the Services, *inter alia*—against which components

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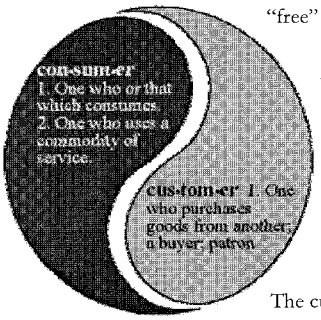
[14] While some argue users should have to pay for their imagery and geospatial information, others argue that information dominance cannot be achieved by rationing the information in this way. Surely, *Joint Vision-2010/20* did not envision that the turbo-charged engine of information dominance would need to be fed quarters, more like a parking meter.

would then draw transparently to acquire commercial imagery, which would then seem as "free" to them as does NTM imagery.




While appealing, this solution ultimately must invoke a "rationing" scheme just as does NTM, inasmuch as the fund would seldom be sufficient to satisfy every demand. Only half jokingly, this can mean that the products are sometimes "freely unavailable."

The current solution is to "ration by price." Commercial products come already priced, which allows the users to be accurately "cost informed" as to the value of the resources they consume—ideally as they are about to consume them.

As previously pointed out, opponents argue that information/intelligence should, like oxygen, be free. Otherwise, to their detriment, warriors may neglect to "buy it," just as they frequently do for training or spares. To repeat: one way to resolve this apparent paradox is enlightened leadership.

### 7.5 NIMA "Commercialization" Strategy

If NIMA is in the information business, to what degree should it emulate commercial information providers? Modern information architecture argues that all of NIMA's information holdings be accessible *via* the "Web"—the Secret and Top Secret versions of Intelink, as well as a Virtual Private Network like OSIS—and that applications be similarly Web enabled and/or Web-served. Here, we consider whether NIMA's "business processes" should follow an e-business model, as well.

NIMA might serve its consumers best if it were to adopt many of the stratagems of commercial e-business. For example, NIMA might:

- ✓ "Advertise" its products by "pushing" news about them to interested subscribers—*i.e.*, those who "opted in" for e-mail notification—and it might deliver with its products accompanying "banner ads" that allowed users to "click through" to additional product and applications information, and doctrine. The goal is to educate the subscribers in context. NIMA's products, maps and images, have intrinsic "eye appeal" and would be well suited to this.
- ✓ Advertise, in context, ancillary services such as training and new applications, both COTS and government-off-the-shelf (GOTS) over the protected Webs; and deliver these products and services over the same media.
- ✓ Use "hot links" on its own products—the soft-copy maps and images it delivers to subscribers—to allow users to click through to substantive collateral materials.
- ✓ Embed context-sensitive training and educational materials within the NIMA products, and enable the user to click through to take advantage of these.
- ✓ Arrange for hot links on other INT products to direct users, in context, to relevant supporting NIMA products.
- ✓ Permit qualified imagery vendors and value-added suppliers to "market" directly to the national security community—this would include qualified outsource enterprises to display available products and services, take orders directly, and fulfill them directly with suitable copies, as appropriate, to NIMA libraries.
- ✓ Encourage commercial vendors to keep (*i.e.*, to "replicate") their own archives on-line accessible over the USG's classified and PVN networks.
- ✓ Provide multiple access pathways to NIMA library holdings, including "commercial vendor" pathways so that goodwill associated with past vendor performance can guide a user's browsing and extraction from archives.
- ✓ Ensure that all products and services—from USG as well as from commercial vendors—carry a meaningful "price sticker" that allows consumption decisions to be "cost-informed."

- ✓ Depending upon "industrial funding" decisions, enable account reconciliation with online payment transactions and balance checking; consider extending the transactions to "real" credit card purchases from qualified commercial vendors who have been invited online.

### 7.6 The Short Attention Span of Most Consumers

The Commission can confirm a shortage of long-term analysis in NIMA—although this neglect does not seem to be limited to NIMA, but rather prevalent throughout the Intelligence Community. As has ever been the case, absent constant vigilance, current intelligence tends to drive out long-range research. A complicating factor, for NIMA, is the fact that the long-term analysis that languishes is more properly the province of the national—*i.e.*, nonmilitary—consumers. Notwithstanding the real scarcity of long-term efforts, the perception on the part of the national consumers may be exaggerated. Beyond the addition of collection and exploitation capacity, the alternative is better communication and credible management of expectations.

The Commission does not believe that NIMA can, itself, effect a rebalancing of short-term/long-term analysis, nor redress the "national-tactical" imbalance, if there is one. It is, in fact, the responsibility of the Director of Central Intelligence, in concert with the Secretary of Defense, to make these trade-offs. Even they, however, are prisoners of a well-meaning, but somewhat feckless, prioritization embodied in PDD-35.

Once envisioned as a justification for, and ratification of, the Intelligence Community's allocation of resources—an allocation that would purposefully reduce or eliminate coverage of some issues and areas, accepting the attendant risk—PDD-35, instead, has not one but two categories of highest importance, another category of highest importance for transient issues, which are remarkably intransigent, and a still higher highest priority of support to US deployed forces. And, of course, this "guidance" is coupled with an imperative to "miss nothing else of critical importance!" The Commission does not debate that these are all of the very highest importance, but does observe that this does not really help make hard allocation decisions. More important it does not help condition expectations nor suppress appetites.

The Commission reiterates that the shift toward short-term issues and away from long-term analysis is neither unique to NIMA nor of NIMA's making. Nor is it solely a reaction to tactical military concerns. In fact, it is a response to pressures from the policymakers as well as the operators. Like it or not, this is the age of "interactive TV news"--when CNN speaks, the NSC often feels compelled to act! The competition that pits intelligence against the news media is corrosive; the news media are not bound by the same needs for accuracy, which is always the enemy of timeliness.[15] The consequences of a CNN misstep is (perhaps) a retraction the next day; the consequences of ill-advised action, misinformed by over hasty intelligence, can be far reaching. Notwithstanding, pressures to focus on the immediate are relentless; we commend the Intelligence Community for its attempts to resist and urge continued efforts for the vital long-term work.

### 7.7 Tension Between "National" and "Tactical" Users

While understandable, the Commission believes this perception misdirected. Worse, the "national-tactical" debate has become a rallying cry for a competition that is already disruptive, and threatens to become destructive.

The context for this issue can be found in a number of recent events and trends: (1) the increasing number of military contingencies requiring intelligence support; (2) the overall increase in intelligence requirements worldwide; (3) insufficient collection capability and too few imagery analysts; and finally, (4) the absence of a single overwhelming target of focus such as the Soviet Union. All of these factors influence the policy/mission rationale and underpinning for intelligence support provided by NIMA.

The Commission finds that the issue is not one of national intelligence requirements versus tactical intelligence requirements, nor is it strategic versus tactical. Rather, the issue is one of balancing long-term intelligence support and analysis versus short-term (*i.e.*, crisis support) intelligence support and analysis. Largely because of the operational pressures described above, perceptions (but not necessarily data) exist that NIMA emphasizes support to the

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[15] As in "haste makes waste."

warfighter at the expense of building long-term analytical capital and support to the national intelligence community. In reality, this is a complex issue, but perceptions have contributed to beliefs that the national Intelligence Community is being shortchanged. The Commission suggests that this issue be framed in the "long versus short" context, but more important that the community needs to recognize that NIMA provides support to a wide range of customers at all levels, all in support of national security goals and objectives.

The Intelligence Community leadership must work to defuse this issue, and certainly refrain from itself throwing gasoline on the fire.

# 8. Is There a "National Versus Tactical" Problem?

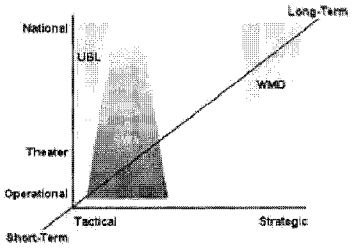
The Commission heard substantial testimony about a so-called "national versus tactical" problem, namely a concern that NIMA's support to national customers, such as CIA, was being sacrificed in order to support the operational demands of the military customers, such as those at European and Central Command. Here, we attempt to separate out the real issues and concerns, and offer some strategies for their mitigation and possible relief.

## 8.1 A Characterization of the Problem

Many officials complained that NIMA's tasking, collection, and exploitation strategies had a negative effect on our understanding of long-term intelligence issues—such as the development and spread of weapons of mass destruction—because of a tendency to emphasize military operational needs, such as those of Operations Southern Watch and Northern Watch. While no one doubted the legitimate need for information about the threat to US forces operating in the area of those activities, many did question whether the volume of imagery collection, the details of imagery collection, or the strategy used to ensure imagery collection was appropriate in light of other intelligence needs.

First and foremost, the Commission was concerned that the discussion about this problem lacked rigor in terms of thinking and taxonomy. While discussants revealed important problems related to imagery collection and exploitation on longer-term issues and questions, they seemed to be describing not one but various problems which in the aggregate could contribute to a perception of a "national versus tactical" problem. Among these were competitions between strategic and tactical intelligence targets, strategic and operational

"National-Tactical"— Refining the Dialogue



intelligence targets, and long-term versus short-term intelligence information needs.

It is overly simplistic to define any customer's requirements slate as being purely focused on national, strategic, operational, or tactical problems; both policy-makers and military commanders alike deal with problems that vary in scope and duration. The accompanying diagram may help us characterize this problem: it points out that this is (at least) a two-dimensional problem. There is the question of who the consumer is for the information—a national-level decisionmaker or an agency such as CIA that is oriented first and foremost to that national policy level, or operators in the theater. And there is the separable question of whether the information primarily serves a strategic or a tactical purpose.

> In the case of Usama Bin Ladin, it is primarily of national-level concern, but decidedly tactical—*i.e.*, short-term focus.
>
> In the case of "Northern Watch" or "Southern Watch—nationally directed, but theater-executed mission in Iraq—the theater is principally concerned, and the focus is also tactical.
>
> In the case of Weapons of Mass Destruction (WMD) the focus is more strategic-long-term and principally (although not exclusively) an item of national-level interest.

What unifies the two dimensions, and best characterizes the real problem (as opposed to the atmospherics) is the issue of long-term versus short-term.

### 8.2 The Need to Turn Down the Heat

This issue disturbed the Commission because of the extent to which it had become polarized—or "politicized"—and bruited about publicly by senior DoD and Intelligence Community officials with little supporting evidence.

A few chose to use this ill-defined problem as yet another reason to condemn NIMA, revisit its creation, and question its future viability as the nation's provider of imagery and geospatial information. Some among the National Intelligence Council (NIC) and CIA continue to dwell on having "lost NPIC" and continually fret about NIMA's role as a

combat support agency. These concerns discolor their perceptions of NIMA and threaten to reduce their own and NIMA's overall effectiveness.

The Commission believes that this issue is sufficiently controversial that it requires the DCI's and SECDEF's attention, in particular, to moderate the political differences and address the real problems.

### 8.3 Identifying Some Component Problems

Concerns about NIMA support to national and tactical customers are best dealt with in terms of specifics, rather than casting the problem as an overall competition. The Commission believes that it is unhelpful to define this issue in such broad terms, and especially perilous to raise it so often and so publicly.

Fundamentally, the problem reflects the scarcity of imagery resources, both collection and exploitation, to deal with today's complex slate of intelligence requirements, especially in the Middle East, Southwest Asia, and North Africa. Whereas the geography of the Soviet Union allowed for many imagery collection opportunities of mutual interest to the national and operational communities, the geography of today's adversaries and interesting intelligence targets create competition both within countries and between countries. The current shortage of long-term exploitation derives primarily from the loss of skilled imagery analysts and the need for the remaining few to spend their time mentoring new hires.

The Commission believes that, while this "national versus tactical" contretemps tends to be overheated, it does contain real issues that merit attention, both by NIMA and by its consumers and stakeholders. Among these real issues are the following:

**Lack of collection feedback**—One difficulty with current processes for tasking imagery collection and/or requesting exploitation is the lack of information available to a requester as to the status of the request. FEDEX™ is the invidious comparison—when one sends a package, it receives a unique identifier, or tracking number, which is provided by the sender to the intended recipient. Both feel satisfied that they can track accurately the progress of the package. No such capability today attaches to requests for imagery and/or exploitation.[16]

**Poor collaboration and communication**—Contenders for imaging capacity often have more in common than they realize. The DCI, in his *Strategic Intent*, has given a high priority to improvements in communications infrastructure for collaboration. Substantive managers need to value more the collaborations that take place today, and to find ways to structure their issues and their incentives so as to increase collaboration, which promotes both efficiency and understanding.

**NIMA as mediator/facilitator**—The Commission found that NIMA gets mixed reviews about its role as mediator of contentions and somewhat better reviews about its role as a facilitator of collaboration. Not surprisingly, the "winners" always like the mediator better than do the "losers." Of course the goal of good mediation (getting to yes) is for neither party to feel disadvantaged. NIMA can help, but the tone has to be set by the Intelligence Community leadership writ large.

**Scarcity of imagery analysts**—NIMA lost a lot of its expertise, both at its creation and in the overall downsizing of IC personnel in the early 1990's. The departure of NPIC image analysts from the imagery analysis business (many are involved in other CIA analytic functions today) reduced the amount of high-level collection and

[16] Or for map production either, for that matter.

imagery analysis expertise, some of which could help mitigate the current concerns through more creative collection strategies. The Director of NIMA is to be commended for recognizing this problem and for formulating a creative plan to rebuild the imagery analytic experience base.

**(Lack of) Proximity of imagery analysts to their all-source customers**—By all accounts, the placement of NIMA imagery analysts at the military commands is highly productive: proximity to the all-source analyst, cognizance of the specific problem set, and collocation with other relevant sources of information all contribute to the heightened ability of the imagery analyst stationed at the commands. Yet CIA and DIA, by virtue of the arrangements made at the creation of NIMA, are bereft of such dedicated, on-site support.[17]

**A focus on short-term problems rather than long-term problems**—A focus on short-term problems rather than long-term problems dogs NIMA, as mentioned previously. As with the rest of intelligence, the imagery enterprise has been driven much more toward a current intelligence focus, whether for national or military customers. Intelligence problems that require more long-term research focus, such as WMD issues, get short shrift in the press of daily business.

## 8.4 Strategies for Relief and Mitigation

Relatively new to the scene are the Assistant DCIs for Collection and for Analysis and Planning (ADCI/C and ADCI/AP, respectively). The Commission applauds the steps already taken by the ADCI/C in improving communication between collectors and consumers, and the creative approach to problems of contention embodied in some studies conducted by his Advanced Collection Concepts Development Center. There is more that he, in concert with the ADCI/AP, can do to institutionalize collaboration and to shorten the loop between requesters and collectors.

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[17] There are NIMA analysts embedded in certain operational activities; this is distinct from more general "command" support to all-source analysts.

In order to relieve the shortage of imagery analysts and restore more emphasis to long-term issues, D/NIMA's strategy is to move 300 positions (60 per year, 2001-2005) from cartography to imagery analysis. Despite a request from the field for half of these, D/NIMA is determined to keep all in the Washington area. The Commission endorses D/NIMA's decision that all should remain in the DC area and be dedicated to long-term issues, which will help restore balance.

### 8.5 Some Longer-Term Concerns

Some mistakenly believe that with EIS and FIA the contention for collection will be eliminated—that we will no longer be collection limited. But if history is any guide, more collection capacity will be more than compensated for by increased demand.

Even in terms of anticipated demand, the Commission has reservations about whether commercial imagery and airborne assets will be able to deliver on their promise. If not, FIA will fall short of expectations and we will be little better off than now—perhaps worse because people will have built availability assumptions into their systems and concept of operations (CONOPS) that will be expensive to repair.

# 9. NIMA and Its Peers and Partners

NIMA could not begin to serve its customers without the active collaboration of other departments and agencies, as well as commercial suppliers. All of USIGS is not NIMA and NIMA is not all of USIGS. NIMA does and must rely on others. Maximizing the benefit of alliances within and without government is the only smart way for NIMA to do its business.

## 9.1 How NIMA Is Viewed by Industry

Industry is generally concerned with NIMA's long-term vision and architecture, business and contracting practices, and maturity of partnership. Although NIMA has taken steps to identify an architecture for the United States Imagery and Geospatial Service (USIGS), many in the industry contend that the requirements are more prescriptive than necessary. Furthermore, the architecture cannot replace a vision of how NIMA sees itself, especially what it considers to be its own core capabilities.

The industry contends that NIMA is an unpredictable business partner and hints that it may lose the support of its industry partners as their commercial opportunities mature and overtake the business base currently provided by NIMA.

NIMA has many contracts to support its geospatial requirements, but the industry contends that they are of short duration, unpredictable schedule, and limited in scope and funding. Additionally, only a select number of prequalified prime contractors provide a limited production capability and only to supplement concurrent NIMA capabilities.

The production contracts are subject to provision by NIMA of source data, which may or may not be provided in a timely manner. The industry contends that because of the unpredictable availability of source data, arcane business practices, and burdensome contracting regulations, it is unable to provide real-time feedback to its end-consumers (*i.e.*, NIMA's customers).

Some in industry believe NIMA performs most of its own information technology work—services, R&D, and integration—when most of it could easily be performed by the private sector. Of greatest legitimate concern to the private sector (and to the Commission) is an apparent NIMA penchant for the government and the contractor to *jointly* integrate various functional and mission-related hardware and software tools. Contractor preference, not surprisingly, would be for NIMA to contract out the entire process as a turnkey service.

Almost all the foregoing applies to NIMA's geospatial production. So far, NIMA has had minimal interaction with the private sector on matters of imagery analysis, even though some in the industry contend that NIMA could profitably offload some long-term analysis work to contractors. The Commission believes that this may be worth pursuing, especially for the more esoteric, science-based exploitation.

### 9.2 NIMA and the Other INTs

As the lead agency for imagery and geospatial information, NIMA has an important role to play in collaborative efforts across agencies. NIMA comes to the fore on two counts: first, it is the presumptive USG leader in setting standards for imagery and geospatial processes; second, NIMA "owns" the geospatial construct which is the most likely touchstone for collaboration among, and fusion of, the INTs.

The Commission notes with satisfaction that NIMA strives to play a constructive role in interagency and commercial fora that seek to set standards for the mechanics of transmitting and storing imagery, and to advance the art and practice of GIS and related disciplines, including, for example, standards for compression and storage of video. NIMA needs to be a leader—but also a listener—in the Open GIS Consortium (OGC). NIMA's objective must be to ensure that USG needs are well served by industry standards. Standards set in disregard of the commercial market do not generally serve the long-term interests of the

government. The Commission is fond of the definition that "industry standards are products that ship in volume."[18]

With respect to collaboration and fusion of the various collection disciplines, or INTs, the Commission believes that NIMA should hold a premier place because it "owns" the geospatial construct. NIMA provides the logical context for fusion of SIGINT, especially ELINT, with imagery. And SIGINT, despite its own suffering, can add considerable value to imagery's contribution.

As previously mentioned, the coming availability of commercial imagery, and associated COTS processing and exploitation tools, threatens continued US information dominance. Note, however, that there are no current plans (nor market demand) for commercial SIGINT. Successful integration of the various INTs, therefore, may provide the United States the competitive edge it requires in order to fulfill *Joint Vision 2010/20.*

However, there does not appear to be a full-fledged, coherent effort to converge SIGINT with imagery (a process that we used to call, "fusion").[19] Among the questions that should be answered without delay are two. Where in the stream from collection to end-use should this convergence be applied? And whose responsibility is it to drive the convergence?

A likely answer to the "where" question is that the convergence should be effected as far "upstream" in the collection-processing-exploitation process as possible, but enabled all the way down to the end-user. In this case, as elsewhere, the Commission observes that what should be a continuum from NIMA to ultimate end-user actually has a discontinuity—NIMA services the higher echelons (as "national" customers), while the Services architect and provision echelons below. There must be an architectural function that subtends both the designs of NIMA (more generally, of the "national" systems) and the last tactical mile

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[18] Thought to be attributed to Scott McNealy, Chairman of the Board and Chief Executive Officer, Sun Microsystems, scottg.mcnealy@sun.com.

[19] There are efforts—referred to variously as "cross-cueing," "tip-off," *etc.* However, this differs from the fusion for analysis and decisionmaking envisioned here.

designed by the respective services. ASD(C3I) must acknowledge responsibility for end-to-end architecture and take more forceful cognizance of the discontinuities that exist.

To whom should we entrust execution of the Imagery-GIS-SIGINT fusion? Against all odds, the Commission feels the answer may well be NIMA. Other usual suspects include NSA and NRO. True, ELINT has traditionally displayed itself geospatially. True, the NRO and the SIGINT enterprise each have more dollar and engineering resources than NIMA. True, NIMA is a new organization striving to fulfill its promise. True, NIMA does not yet inspire confidence in others (and may lack confidence, itself). Still, the Commission argues, the responsibility is logically NIMA's. Why? Because the geospatial construct is the obvious foundation upon which fusion should take place.

Ineluctably, most military "business processes" are planned and executed within a geospatial reference framework. Within the National Security Community, NIMA "owns" that framework. It sets the standards, and provides the controlled base data. It provides the integration platform for data from other intelligence sources. As a consequence, NIMA should be empowered to specify the "desktop"—the way in which users interface with, request and manipulate data of all sorts.[20] For nearly every task, the screen is the map and thus the point-and-click entry to nearly all information. This desktop metaphor closely matches two-and-a-half of the three critical questions any analyst or operator asks: namely, "What is happening here? Where are the…?" Even most "When…?" questions can be posed within this contextual framework, providing that all data are "time-tagged," as the Commission argues, elsewhere, as they should be.

### 9.3 NIMA and Foreign Government Activities

The Commission was surprised and impressed by the extent to which NIMA's MC&G relationships with foreign governments yielded cartographic data that offset considerable cost that NIMA would otherwise incur.

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[20] However, the Commission acknowledges that the Defense Information Services Agency (DISA) may have a "process" claim to the desktop specification that equals NIMA's "substantive" imperative.

# 10. NIMA and Its Suppliers

## 10.1 NRO and FIA

The mission of the National Reconnaissance Office is to enable US global information superiority, during peace through war. The NRO is responsible for the unique and innovative technology, large-scale systems engineering, development and acquisition, and operation of space reconnaissance systems and related intelligence activities needed to support global information superiority.

The NRO designs, builds, and operates the nation's reconnaissance satellites. As one of NIMA's imagery suppliers, the NRO plays an important role in helping achieve information superiority for the U. S. government and Armed Forces. Through NIMA, *inter alia*, NRO products can warn of potential trouble spots around the world, help plan military operations, and monitor the environment.

The discerning reader will note that this is not precisely the way the NRO would characterize itself. The Commission is anxious to emphasize the role of the NRO in context: the NRO is a supplier to NIMA—true, the NRO is more venerable and better financed, but its role is properly thought of as a supplier to NIMA. It is important for the NRO and the Intelligence Community to get this picture. In part, it is a previous failure to understand the relationship that has led to the collection-centric behavior of the Intelligence Community, which funded FIA without real thought to funding imagery TPED.[21]

FIA, the Future Imagery Architecture, is the program for replacing the current constellation of satellite imaging vehicles, and associated ground processing systems. For the first time, the design of an NRO system was dictated more by requirements and less by technology, and was "capped" in terms of overall system cost. As a consequence of the requirements

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[21] Of course, there is a countervailing view that the NRO, *via* technology pull, provides the engine that drives NIMA and is best left in the driver's seat, as well.

versus technology change, it will end up delivering imagery, much of which could be acquired from commercial imagery providers whose technology is not far below that of the NRO. As a consequence of the funding cap, there are currently five capabilities validated by the JCS, which FIA will not provide. From the Commission's perspective, the phasing of FIA, which delays integration of airborne and commercial imagery into the "system," is suboptimal.

### 10.2 DARO, Where Are You When We Need You?

NIMA has the overall national imagery mandate but, with the recent demise of the Defense Airborne Reconnaissance Office (DARO), it is unlikely that NIMA can adequately provide for the tasking, processing, exploitation and dissemination (TPED) aspects of aerial photography, whether from manned or unmanned aerial vehicle (UAV) imagery collection platforms.

From the perspective of this study, DARO needs a successor. The Intelligence Community, civilian as well as military, cannot let the issue of a focal point for airborne reconnaissance remain unaddressed. A clarion note should be sounded, for the Congress and for the Services, that there should be convergence and economies of scale across the future of airborne recce.

The Commission also wonders whether theater airborne imagery reconnaissance may become a "net minus"—a drain on imagery capacity rather than a contributor. The problem is that the current generation of airborne imagery platforms is becoming increasingly vulnerable as anti-aircraft technology improves. Either the airborne imagery platform will have to fly at a longer standoff, decreasing its resolution and thus its utility, or it needs to be protected. Thus, prudence dictates that the recce aircraft fly only under the protection of an air cap, which in turn requires an AWACS aloft. But in order to ensure the survivability of those assets, and to give them retributive targets in the event of hostile lock-on, the mission planners need to know the location of SAMs which, if mobile, require recent imaging, which means tasking, *inter alia*, satellite imagery assets. An alternative to manned reconnaissance platforms is, of course, the UAV, which was to have been so cheap as to be "disposable",

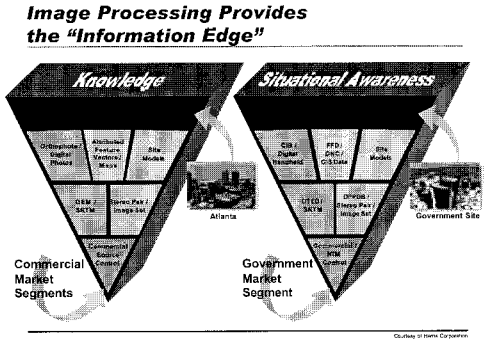
but which has turned out to be so expensive that it, itself, has become a high-value asset that must, in turn, be protected if flown in harm's way, which requires imagery, etc.

### 10.3 NIMA's Changing Role in a World of Commercial Suppliers

NIMA faces a fundamental business problem that it must solve if it is going to lead the information edge.

Currently, NIMA owns the market for geospatially referenced intelligence analysis, both in terms of being the largest customer for these intelligence products and in terms of being the main supplier of the digital source for these products. Thus, NIMA is in the unique position of being the largest customer for and the largest supplier of these materials. This monopoly is starting to erode, however, as a commercial market for competitive business intelligence based on analysis by and from commercial sources grows. NIMA's role is also beginning to erode as the contractor base finds it harder and harder to justify doing business with NIMA when NIMA is viewed as being neither a steady and reliable customer nor a steady and reliable provider of source data sets.

As one can see in the accompanying graphic, the distinction between the commercial market and the government market has come down to a single point, the source for the visual analysis. The commercial world relies solely upon commercial and open sources; whereas, the government can also use national assets for its source materials. The differences beyond the source are purely semantic, and the ultimate product is the same– "The Information Edge." The commercial world speaks of competitors while the government speaks of enemies. The speed of the marketplace is the same as the speed of



the battlefield–in both, seconds do count. Industry also suffers from its own version of the "fog of war."

NIMA's primacy as the market driver will not decline immediately. NIMA will, however, continue to lose its dominance in direct relation to the speed with which the opposing market forces increase. If NIMA does not maintain its position as being the driving force of the market, NIMA will not be able to continue to lead and direct the technological advances in both tools and sources that support its mission. In short, NIMA has to realize that it is in a market that is growing more and more competitive everyday.

The fundamental question to NIMA's survival is whether it can change the way it works in order to take advantage quickly of developments from the mainstream commercial sector–here defined as being those private sector industries that are more driven by the commercial marketplace than by direct government funding. Also, NIMA must deploy analytical systems that allow its customers to directly give NIMA new ideas regarding the technology and services that NIMA deploys--this is key for NIMA to remain a premier intelligence provider.

All the documents presented to the Commission and all the people who have spoken before the Commission have stated that innovation is the key to NIMA's future. Unfortunately, NIMA is holding onto legacy business processes that do not provide it with the flexibility necessary to adapt. This is understandable, since the changes NIMA needs to make are against its existing business model, which is based on the business practices and technology that have sustained NIMA so far.

NIMA, however, has to "commercialize" itself. It has to adopt the disruptive business models of the "dot-com" world in order to move at the speed of innovation. In short, NIMA must evolve or die.

In the text, *BEST TRUTH: Intelligence in the Information Age*, the authors write that the most remarkable aspect of the information revolution is not the technology itself, but the ways by which information is "managed, produced, and consumed." The continuation of the revolution is not a centralized affair; rather, it is highly decentralized, in that the users of the information now have at their disposal the ability to envision, design, build and deploy

systems based on commercially available tools. This is anathema to the centralized, hierarchical acquisition model upon which most organizations have thrived for decades. NIMA must realize that if it is to indeed *define* the information edge, it cannot centrally change itself based on a schedule; rather, it must push the tools for change down to the user. NIMA must give the customers of NIMA's materials the tools they need to innovate.

One of the major reasons for NIMA needing to push the innovation down to the desktop of the individual analyst is that the post-Cold War intelligence mission has become more *ad hoc* and chaotic than before. NIMA can counter this nonlinear mission by allowing the users of NIMA's tools and sources to give NIMA the ability to "self-organize"–that is, to dynamically adapt NIMA to changing mission needs. This, however, requires an architecture that allows the users to develop and adopt their own tools within a commercially viable hardware and software platform. This flexibility is only possible outside a traditional, centralized approach to system development and acquisition.

NIMA can take a lesson from a commercial giant, General Electric, and its race with Bell Laboratories to invent the transistor, which is recalled in Lester Thurow's article, "Brainpower and the Future of Capitalism." Bell Laboratories developed the transistor exactly one day prior to General Electric. The reason for this delay was that General Electric gave the job of testing the transistor to its vacuum tube engineers. The vacuum tube engineers spent three years trying to prove that the transistor would not work. Bell Laboratories, on the other hand, spent its time trying to prove that the transistor would work. As Thurow so clearly puts it, "There were five companies in America that made vacuum tubes and not a single one of them ever successfully made transistors or semiconductor chips. They could not adjust to the new realities." If GE had spun off a new company based solely upon the viability of the transistor, then GE would now have all the patents and Nobel prizes and revenues from the transistor. More importantly, GE would also have been in a better position to benefit from the revolution in miniaturization that marked the introduction of the transistor. Instead, GE ended up having to buy transistors and semiconductors from various suppliers.

NIMA will have to recognize *its* new realities, and adjust accordingly, since, unlike a commercial venture, NIMA will never go out of business–NIMA's business (the generation

of intelligence), however, will suffer if NIMA cannot adopt these disruptive business practices. NIMA will have to set up its own in-house competitors, whose only charter is to "break the old to make the new." Nothing should be sacred to this group–neither process nor product. In this way, NIMA will not run the risk of asking people with conflicting interests to generate new ideas.

Another example which focuses more on the generation of intelligence from a consumer's perspective is also helpful. Recently, Walker White, Chief Technologist of Oracle, recalled a business decision he made while waiting for a flight at SFO. The airline representative told him that his flight would indeed be arriving shortly and that his flight would indeed depart on time. Walker accessed the Internet via his Web-enabled digital phone, went to *www.thetrip.com*, loaded his flight information, and found that his plane had left LAX, was traveling at 25,000 ft., was cruising at 400 knots, and was headed south. Walker states that even he can figure out that the flight will not be arriving "soon," and will definitely not be departing "on time." Walker then goes to a competing airline, exchanges his ticket, and arrives home a little later than planned but not as late had he stayed with his original itinerary.

NIMA has to understand that the Web is going to be its future, regardless of what NIMA would like to do. Otherwise, it will be in the position of being a misinformed airline representative trying to convey an incorrect explanation to a more knowledgeable customer. Everyone must utilize Web-based technology, since all vendors are building Web-enabled tools. The Web is now unavoidable, which means that businesses are moving to the Web and vendors are building the tools that allow the businesses to move.

The increase in capability and capacity in both hardware and software, NIMA's customers are in the position of being Walker White–except for the fact that NIMA owns the source material. NIMA's customers do not have to wait for NIMA to execute a grand design of a system; they can–and do–cobble together systems that can exploit NIMA's source materials. White knew that the airline representative was either lying or misinformed. NIMA's customers know that NIMA is either a well intentioned yet bloated bureaucracy or an organization that is out of touch with its customers or both.

NIMA can correct this, because NIMA has allowed it to happen by abdicating its oversight authority of its contractor base. Thus, the contractors will be true to their in-house knowledge and business plans and will deliver a product that best meets the needs of both NIMA and the contractor's stockholders.

### 10.4 Commercial Imagery Providers

NIMA has the statutory and logical responsibility for "buying" all commercial imagery (and geospatial products). NIMA has graciously interpreted this to mean that it is to facilitate the transactions and assure that, if required, the content (intellectual property) can be shared across the relevant national security community. And at least in an early prototype, NIMA chose the online "Mall" model that we see with commerce on the public Internet.[22]

The Congress showed keen insight in designating NIMA the DoD and Intelligence Community sole focal point for commercial imagery. Not to be outdone by itself, however, the Congress, one year, denied NIMA the funds necessary for purchasing that imagery. The administration topped that, in successive years, by failing to request sufficient funds, a move that the Congress then trumped by authorizing and appropriating funds that were not requested. Most recently, the NRO announced an on-again, off-again, Billion Dollar Buy. The Commission observes this hot-potato approach with wry amusement; if it weren't serious it would be funny.

NIMA has, rightly, assumed responsibility for provisioning the Library/Warehouse with data, including commercially obtained products. Rightly, too, it has decided that it can franchise to those commercial interests the job of vending products directly in the Library/Warehouse/Mall. NIMA's job should be to ensure that the shelves are full of quality stock. There should be an "archive manager" whose job it is to evaluate and grow the value of the holdings, including the ability to order imagery "on spec." Users should be empowered to make their own ordering decisions. In order to keep the transaction costs

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[22] The implementation, as we understand it, is on a protected "intranet" or "Virtual Private Network" (VPN), which provides some operational security and duly diligent protection of the intellectual property rights of the vendors. If need be, the information can be replicated onto an intranet at the SECRET level from the unclassified, Official Use Only, level.

low, the actual cash stash—duly requested by the Administration, appropriated by the Congress, and preserved in the Office of the Secretary of Defense—could be administered by NIMA for OSD. This commercial imagery fund should be the vehicle for end-users to buy both raw imagery and vendor's value-added offerings. The Commission estimates that, for the first year, $350 million seems about right; based on what the Commission expects to be a positive experience, that number should be expected to rise substantially throughout the FYDP. Note that this suggested amount for end-user purchases is exclusive of traditional outsourcing of NIMA legacy products, *e.g.*, maps.

In the FIA, the question of commercial imagery is to be addressed, but too late[23] and, it appears, with a less-open model.[24] What is sorely needed is a policy review and coherent strategic direction for the use of (and reliance upon) commercial products. When planning FIA, consideration was given to the then-current generation of commercial imagery, which did not significantly change the equation. The FIA planning "error" was in failing to realize that a commercial generation was half as long as a government generation. In retrospect, FIA planners might better have bet on the come, anticipating the commercial imagery that would become available contemporaneously with FIA. This likely would have changed the equation and permitted FIA to move "upscale"—move its sensors to a higher technological plateau, to include, say, HSI—and, in the event, be more complementary and less competitive with commercial imagery.

### 10.4.1 NIMA's Commercial Imagery Strategy

NIMA engages the commercial imagery industry as a user of commercial imagery in support of its own missions; as the central purchasing agent for the DoD and Intelligence Community; as the agency responsible for the tasking, processing, exploitation, and dissemination of commercial imagery; and as a contributor to the policy processes by which the government regulates the commercial imagery industry.

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[23] The ASD/C3I has a good, if leisurely, plan to address commercial (and airborne) imagery in later phases of FIA.

As the functional imagery manager, NIMA should advocate commercial imagery, especially where it satisfies a unique need and/or offers unclassified information-sharing opportunities. In 1998 NIMA and NRO developed a commercial imagery strategy to take advantage of the emerging US commercial imagery industry. Included in this strategy was a provision for the "unambiguous commitment" to commercial products and services. The strategy was rolled out, publicly, signaling a new approach to commercial imagery by the US government with important implications for its overall imagery architecture.

Yet, implementation of this strategy remains unfulfilled.[25] Areas of concern to the Commission include:

**Strategy and philosophy**: NIMA has been slow to adopt commercial imagery, although trend lines are improving. Until recently, NIMA had a poor understanding of how commercial imagery could meet existing or future imagery requirements. NIMA has failed to elaborate on the relationships between classified imagery information and commercial imagery, whether in terms of real cost or comparative advantage in using either one. Moreover, NIMA still tends to consider raw imagery as the sole commodity to be acquired from industry rather than value-added products and services, including imagery analysis.

**Coordination of Commercial Imagery Purchases**: NIMA gets mixed reviews on its role as the central coordinator of commercial imagery purchases for the Department of Defense and the Intelligence Community, especially from field elements. While NIMA's licensing agreements provide a discounted price to the US government, as well as a central repository for imagery, current DoD and other users of commercial imagery do not understand the process.

**People:** NIMA's Commercial Imagery Program has suffered a high turnover of personnel during its early years. The Commission believes that a senior officer must

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[24] At issue is whether the vendors of commercial imagery have the opportunity to interact with, and "drop ship" their wares directly to, end-users, primarily on an unclassified (SBU) network, or whether their products will immediately be scarfed up into a classified network, thereby isolating them from users, for the most part.

have responsibility for this position. NIMA has made little progress in refining their and their customers' understanding of the real costs associated with imagery.

**Funding**: Insufficient funding imperils implementation of the Commercial Imagery Strategy. The funding levels envisioned in the current strategy appear small, given the potential payoff to the nation.

**Architecture**: While NIMA correctly envisions seamless tasking, processing, exploitation, and dissemination of commercial imagery, it has by necessity developed a separate architecture to handle commercial products. NIMA should accelerate its plans to integrate commercial imagery products into the FIA MIND.

**Acquisition model for commercial imagery:** NIMA continues to think about the commercial imagery industry predominantly as a source of raw imagery, rather than as a provider of a more varied slate of products and services.

NIMA also plays an important role in the US policy and regulatory processes related to commercial imagery, including licensing. While the Commission believes that NIMA has played a more supportive role than other Department of Defense and IC agencies, it should continue to play a stronger advocacy role for commercialization, especially in light of strong consumer demand.

Finally, while the Commission believes that a shift may be occurring within NIMA with regard to commercial imagery, it is a shift that is neither fast enough nor done with sufficient conviction. Remote sensing commercialization is taking place within a broader US national strategy that NIMA has not yet seen fit to fully endorse or encourage.

### 10.5 Commercial Value-Added (GIS) Product Suppliers

NIMA needs to view the commercial imagery industry as more than just a source of imagery. The commercial sector can provide some of NIMA's imagery analysis services and most value-added geospatial products that can meet most, if not all, of NIMA's requirements.

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[25] This despite the on-again, off-again, Billion Dollar Buy of commercial imagery announced by D/NRO.

There is a long tradition of nongovernment mapping activities, and there has always been considerable commercial capacity to produce such products. Although a lot of that capacity was embodied in small, "mom and pop" shops, there was a lot of vitality and innovation. The current plentitude of shrink-wrapped GIS software is a testimony to the vigor of the commercial industry. Most recently, the industry has been undergoing some restructuring on its own and also in anticipation of NIMA needs. There is both horizontal and vertical integration. Most notably, the commercial imagery providers see their future not in providing commodity imagery, but in selling value-added products and services built upon their imagery offerings. NIMA is seen as an underdeveloped segment of this market, and it is.

### 10.5.1 NIMA's Buying Habits—Actions Speak Louder Than Words

The Commission lauds NIMA's espoused goal of buying such products from commercial industry. By all accounts, however, the execution of this strategy lags. The temptation is to lay the blame at the feet of institutional resistance to outsourcing, which naturally stems from internal job satisfaction and a feeling that they can do it better, as well as a modicum of job protection, *per se*. Some Commissioners observed that the NIMA processes for ensuring quality (QA/QC) may be influenced unduly by workforce protectionist instincts rather than real quality control concerns. Another chokehold that NIMA can exert is the failure to provide source data/imagery in timely fashion. As mentioned elsewhere, the coming availability of high-quality commercial imagery should alter this equation: classification is no longer a valid excuse for delay and the product suppliers can, themselves, contract for source materials without depending upon Government Furnished "Equipment" (GFE).

There appears to be a tendency on the part of some in NIMA to view its GIS vendors as simply a "body shop"—a *de facto* supplement to its workforce. This handicaps the contracting officers, stifles vendor creativity *vis a vis* higher value-added products, and means that NIMA generally is perceived as a poor business partner.

There are, however, many in NIMA who are to be commended on their commitment to get the in-house/outsourced balance correct. The Commission was particularly impressed by those in NIMA who are exploring the diversity of outsourcing methods.

### 10.5.2 A Strained Relationship with Industry

The Commission was treated to a gentle, but ubiquitous perception–held by contractors and vendors—that NIMA was not a good, dependable business partner. In part, this perception is held by contractors about all government agencies with which they do business and/or would like to do more business. The US government arrogates to itself some unique business notions: its contracts call for "termination for convenience," the government's convenience, that is. The year-to-year funding of government agencies reflects itself in language that conditions long-term commitments on "the availability of funds" and leads to a "hand-to-mouth" existence for some suppliers for whom the government is the major customer.

Beyond the ordinary, however, NIMA has been characterized as an unreliable partner. NIMA-specific complaints are due partly to NIMA's own penurious state, the growth of its mission, and the relentless march of technology that injected early obsolescence into last year's plans. And perhaps subtle sabotage springs silently and unbidden—sometimes unconsciously—to the minds of workers forced to confront outsourcing many of their "birthright" jobs. Notwithstanding, NIMA can and must establish a better relationship with its commercial suppliers.

Among the compelling reasons for burnishing its image with its commercial suppliers is that as commercial imagery and derived applications take off in the commercial sector, NIMA's own position as a favored customer is marginalized. This has happened before, especially in the information technologies, which is where NIMA is largely positioned.

One positive step that NIMA must take is to ensure that its staff, and especially its contracting corps, understands better the business of business. The Director of NIMA is to be commended for convening an industry forum in which NIMA talks *and listens.*

# 11. NIMA Management Challenges

At the highest level, the Director of NIMA operates under two sometime-handicaps. The first is the ambiguity of whether, or when, he works for the DCI or the SECDEF. The second is his relatively short tenure.

## 11.1 The Role of the DCI Versus SECDEF

While the DCI and SECDEF have ultimate common purpose, their missions are distinct, their methods disparate, and their day-to-day priorities not always congruent. In drafting the National Security Act of 1947, arguments were advanced as to the desirability of placing foreign intelligence within the Defense Department, under the Joint Chiefs of Staff. The decision to form an independent agency, CIA, headed by an independent director reflected the desire for independent intelligence in support of national security policy decisions.

From its inception, the Central Intelligence Agency has held some sway over strategic reconnaissance—from the U2, to the SR-71, to imagery satellites—and the Director of Central Intelligence had been the developer of strategic reconnaissance assets and arbiter of how the resources would be used.[26] Times change, of course. The SR-71 was retired, and the U2s transitioned from national to theater assets. Imagery satellite tasking, however, has been retained under the thumb of the DCI, *at least in the absence of major hostility.* There is a relatively recent agreement between the DCI and the SECDEF, generally referred to as the *Transfer of Tasking Authority*, which provides for final adjudication to transition to defense under "wartime" conditions, or when the President so directs.

## 11.2 The Tenure of the Director of NIMA

The Commission finds that the present tour length of a Director of NIMA, two to three years, is insufficient to complete execution of the plans and programs of this young

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[26] This was not accidental, but a deliberate decision of then-President Dwight D. Eisenhower, anxious to see "civilian competition to the military," a situation that has prevailed, *de facto*, until the present. It has, however,

organization. Institutionalizing change is never easy as there frequently is subtle resistance among subordinate levels of management. A longer tour reduces the opportunity for those subtle resistors to simply outlast the Director. Nor is this problem unique to NIMA. The National Security Agency, going through a rebirth, is said to be similarly afflicted.

The answer is simple. Having chosen the right person to lead the organization, his/her length of tour must be established at the outset as, say, five years. This should allow for a reasonable chance to fully carry out and institutionalize needed changes without being impelled to embark prematurely on changes before taking sufficient time, at the onset of the tour, to understand the organization, or to run the risk of running out of time.

As with NSA, the (shorter) history of NIMA is to be led by a general officer nominated by a military service, concurred in by the DCI, and appointed by the SECDEF. For a senior flag officer, Congress, too, has a say. It may be that the uniformed military are unwilling to commit to so long a tour for a senior flag officer because of a "star" problem—a problem that Congress could, in fact, solve. Alternatively, civilian leadership should be considered with a military officer as deputy. Whatever the solution, the objective is to ensure better continuity and sustain the momentum.

### 11.3 The Job of Director, NIMA

Being Director of NIMA is not easy. Defining the job of the Director of NIMA is not so easy, either. Is he the principal (substantive) imagery intelligence officer? Or, is he an information factory manager? This ambiguity simply mirrors the bifurcation in NIMA's mission.

Externally, D/NIMA seeks to serve (at least) two masters, the Director of Central Intelligence and the Secretary of Defense. Fortunately, there is considerable congruence in their missions. Unfortunately, there are some differences. Internally, the Director of NIMA tries to harness two cultures, in two cities. His two principal product lines, imagery intelligence and maps, have two distinctly different clienteles. Imagery intelligence has its

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been eroded by the change in U2 status, and the *Transfer of Tasking Memorandum* that provides for a change in final adjudication from the DCI to the SECDEF under "wartime" conditions or when the President so directs.

number one customer in the White House; maps have their number one customer in the foxhole.

His mission increasingly depends on technology, but his workforce is grounded more in the liberal arts. He is underresourced and cannot depend wholly on his upper-management corps. His fount of expertise is being drained by retirements and by those who would rather return to their CIA roots than take the DOD pledge.

### 11.4 Authorities of the Director of NIMA

The Director of NIMA said, and the Commission agrees, that he currently has sufficient authorities with which to execute his responsibilities.

The Commission does observe that D/NIMA has been deliberate about the exercise of his responsibilities as functional imagery manager, presumably constrained by real resource limitations and a realistic concern about shocking the system. Notwithstanding, the Commission suggests gently that D/NIMA signal his intent to incrementally increase his forcefulness in order to achieve more quickly his strategic objectives.

DOD Directive 5105.6 specifically identifies D/NIMA as the functional manager for imagery, imagery intelligence, and geospatial investment activities for all budget categories—the National Foreign Intelligence Program, the Joint Military Intelligence Program, and most important the Tactical Intelligence and Related Activities.

The D/NIMA can and does provide guidance to the IMINT community to ensure that investments are in line with the USIGS framework. While the D/NIMA can control investments in his own agency, his influence on his mission partner, the NRO is problematic and he has next-to-no *de jure* influence over investments made by the Services, which have their own appropriations and authorizations in the TIARA Program.

Others have tried to harness the NRO and the Services and failed. Still, the Commission wonders if there couldn't be an effective approval process which ensures that *all* IMINT investments comply with guidance from the functional imagery manager, D/NIMA.

### 11.5 D/NIMA Span of Control

Some among the Commission believe that the span of control of the Director of NIMA is too broad and would recommend reorganization. Sometimes—particularly in a young or untested organization—the apparent solution to every problem is a dedicated manager or senior staff officer with a "direct report" to the top. Usually, this indicates that the overall business model of the organization has yet to gel.

The Commission has no concrete examples to indicate that the current Director is spread too thin and that some important matters have suffered from a lack of his attention. Indeed, the Commission is impressed by the overall effectiveness of the current Director and his senior leadership team, considering the stresses to which this tender organization is exposed.

If there is a legitimate concern, it is not with the present operation, but with the need to establish tomorrow's leadership, which generally involves more, rather than less, delegated authority.

### 11.6 NIMA Culture(s)

Two sets of forebears, two legacies, two missions, two cultures. Can the promise of NIMA—to take advantage of the technical convergence between imagery and mapping in the digital age—be fulfilled without an overarching culture? The Commission suspects not.

Each culture perceives the other as failing to understand its specialty, and each (but especially imagery analysts) feels disadvantaged by having to work for a manager of the opposite persuasion. Both worry that convergence will turn all the princes into frogs, rather than the frogs into princes. The Commission believes that nothing could be further from the truth: enlisting all the NIMA disciplines in a single mission, uniting the workforce, and melding the cultures will enhance the effectiveness of each.

NIMA management has been justifiably cautious about espousing convergence as the goal and forcing the respective cultures to confront head-on the issues that separate them. NIMA management appears to be genuinely conflicted, both about the worthiness of the goal—witness the bifurcated mission statement—and about whether the pain will be worth the gain, which is understandable, if regrettable.

It is all too easy for outsiders to be impatient with the progress and therefore critical of NIMA management, and the Commission is uneasy in urging greater haste. It is possible that the inevitable just takes a little longer, that familiarity breeds admiration rather than contempt, and that the organization is still too fragile and the stakes too high to press harder.

The Director of NIMA seems genuinely committed to the desirability and eventuality of greater synergy, if not outright fusion, of the two disciplines, and is working to instill this commitment in his senior managers, many of whom already "get it." With perseverance, this will percolate through management layers, as well as bubble up from the working level where the synergies are sometimes more evident. The Commission hopes that there will be time for this approach to work.

The Commission believes that WorkForce-21 offers an opportunity to reward tangibly those individuals who seek, master, and constructively employ, both kinds of skills. Promotion and compensation, as well as official recognition, are the incentives that management can use to motivate desired behavior, and WorkForce-21 potentiates these management tools.

The Commission also believes that internal connectivity, training, and facilities all need to be improved with an eye toward overcoming cultural barriers.

### 11.7 WorkForce-21

Change is always unsettling to the majority of a workforce, and NIMA is no exception. Change highlights the fact that one worker's opportunity is another's peril. The NIMA workforce needs to understand which performance metrics embody leadership's expectations and are considered critical to the overall success of the organization. WorkForce-21, if executed properly, holds out the promise of ensuring this.

WorkForce-21 moves away from what some have considered the overly paternal civil service model and toward heightened individual accountability for one's performance and one's career development. The pillars of WorkForce-21 are enunciated, incentivized expectations and reward for individual initiative.

Within the NIMA workforce, the Commission found some serious concern about the organization's Key Component leadership reflected in an employee survey conducted after WorkForce-21 had been initiated. Many of those interviewed, both in the survey and by the Commission, believe there is an absence of robust Key Component leadership; some also feel that existing authority is too centralized. WorkForce-21 attempts to reduce the inimical influence of old-style management's old-boy/girl network. The success of WorkForce-21 will depend on middle management, which, after all, must translate the vision of superiors into workaday instructions for subordinates.

The Commission cannot help but remark that NIMA, like many government agencies, and quite distinct from good business practice, seems, *de facto*, to have used its workforce downsizing as an opportunity to reduce, rather than improve quality—only in the government!

### 11.8 SES/SIS Billets

NIMA requires an increasingly technical and skilled workforce and exceptional leaders to help it usher in the FIA area. NIMA is disadvantaged by the small number of SES/SIS billets it currently has—about half the overall government average, and many fewer, *per capita*, than its sister intelligence agencies. The Commission considers it unlikely that it can find and retain the caliber of officer it needs and deserves unless the roster of SES/SIS positions can be ameliorated.

The Commission recommends an increase in SES/SIS billets in its primary mission areas, imagery analysis, and geospatial information services. And while such "supergrade" positions would also benefit the systems engineering and acquisition activity, the Commission urges that consideration be given to creation of an "Extraordinary Program Office" (EPO) with rank and pay scale "outside the system" as detailed subsequently.

### 11.9 Workforce Expertise

The Commission sees some evidence that NIMA's progress as an effective and efficient organization is constrained by insufficient and inexperienced staff in some critical areas. In addition to the previously remarked upon shortages of highly experienced imagery analysts

and systems engineering and acquisition staff, NIMA is light in unique areas like imagery science.

### 11.9.1 Imagery Analysts

The Commission observes that the decline in experience and expertise in NIMA's Imagery Analyst corps has seriously impaired NIMA's ability to support its customers. Not limited to NIMA, as the Commission notes, the downturn in analytical expertise is due to both loss of experienced people and the fewer lessened number of years of experience held by the new hires. NIMA's imagery analyst workforce has declined, on average, from 13 years of experience to 11 years of experience, and 40 percent of the imagery analysts have less than 2 years of experience. This situation leads to more experienced personnel having to devote more time and effort to both training and mentoring, and consequently less time to supporting NIMA's customers.

### 11.9.2 Imagery Scientists

The term "imagery scientist" can be subject to multiple interpretations.

> One might conjure up the image of a scientist who worried about the chemistry of films, emulsions, photo-sensitive materials, and D-log(E) plots or the electronic-age equivalent who worries about CCD-arrays, spectral sensitivities, density functions, gamma corrections, orthorectification, *etc.*—*i.e.*, the "science of imaging."
>
> Alternatively, one might think of a scientist who understands the phenomenology of a problem and its imagery observables—how the hyperspectral "image" information might distinguish between an emissive cloud of toxic nerve gas and the benign effluent from a baby milk factory; or how the thermal infrared image distinguished between a real SU-27 and a plywood decoy on the tarmac.

Clearly, the imagery intelligence business needs both, and the cartography business benefits from the first, if not the second.

However, as understood by the Commission, it is the second interpretation that underpins the assertion that the Intelligence Community has a paucity of "imagery scientists." It is the science-based exploitation of the image that must be nurtured by NIMA.[27] The question is whether NIMA can have such scientists in-house—*i.e.*, as USG employees—or must look to industry, academia, and the national labs for such expertise. The Commission suspects the latter is the case: NIMA would find it hard to accommodate the number of diverse scientists required, could not support their professional development or advancement, and would otherwise have trouble attracting and keeping them. Better to rely on extant "centers of excellence" and, in their absence, to stimulate such centers.

The Commission agrees that there is a shortfall in "imagery scientists" so defined. In fact, the Commission notes the broader shortfall in the Intelligence Community of sound "targeting"—*i.e.*, understanding the "business processes" of the target, modeling and simulating these, and mapping them to infrastructure, all of which then suggests the set of observables, against which multi-INT collection can be launched and upon which all-source analysis can be based. There is realization, in the Intelligence Community of the desirability of better targeting and examples of innovative targeting—*e.g.*, by the "issue managers" and on their behalf by the ADCI/C-sponsored Collection Concepts Development Center (CCDC). The NRO, too, often sponsors early science-based work in support of new collector concepts.

For NIMA, the Commission concurs in reliance on external sources of expertise for such science-based problems insofar as NIMA cannot, itself, attract and retain such skills.

### 11.9.3 Engineering/Acquisition Expertise

NIMA lacks the sufficient expertise in systems engineering/systems integration and acquisition sufficient to carry out an efficient and effective large modernization program. The Commission believes this situation must be rectified in order to successfully implement the USIGS program and the Commercial Imagery Strategy. The Commission believes that

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[27] The vibrancy of the commercial photo market, both film and digital, guarantees that there will be no shortage of expertise dealing with the science of imaging.

NIMA needs to bolster its staff in this critical area and that it cannot do this, in time, "within the system." It recommends, therefore, that NIMA create—as described in detail elsewhere—an "Extraordinary Program Office" (EPO) with the active help of the DCI, SECDEF, and Congress.

### 11.10 NIMA Management

Management, in any organization, is a critical and often weak link in the chain. NIMA, in its time of change, absolutely must rely on management, especially those seniors who report to the Director. Change, whether inspired by vision from the top, or insights from the bottom up, always confronts its highest hurdle at this level. NIMA does have many qualified executives and managers; it just needs to ensure that all its management corps can pass the test.

### 11.11 NIMA Resources

The Commission finds little disagreement as to the fact that NIMA is severely under resourced given the expanding mission and the need to modernize USIGS in light of FIA. Not surprisingly, there is considerable disagreement as to the fount from which the needed resources should spring, and incessant caviling about whether NIMA, as currently constituted, is capable of efficiently executing the funds that it surely requires.

The Commission finds little logic in the argument that, although they need the money, they are not yet capable of spending it wisely and so can make do with less. Try as it might, the Commission cannot think of an instance where an inadequate organization can do the job more cheaply than a first-rate organization. And the job has to be done.

The answer, of course, is to provide the resources and support NIMA's becoming the first-rate organization it needs to be. Elsewhere, the Commission recommends creation of an "Extraordinary Program Office" (EPO) with world-class talent whom none could gainsay. Staffed and armed with the authorities recommended by the Commission, the EPO will surely reduce the cost of the overall program. Still, the current budget (POM/IPOM) will need to be fattened considerably to realize fully the promise of FIA and USIGS. Get used to it.

In retrospect, the Commission opines that had the stand-up of NIMA included a more rigorous analysis of the true costs of programs and projects to be undertaken by NIMA, the DCI and SECDEF might have avoided the past four years of acrimonious budget debates.

NIMA's first budget (FY 1997)—far from the result of careful, deliberate analysis of all the functions and missions assigned to it—was the agglomeration of projects and programs inherited from the CIA, DIA, NPIC, DMA, NRO, *et al.* Since 1997 NIMA has consistently requested and received "over-guidance" funds. Each year since its stand-up, funding for NIMA programs has been a major issue for out-of-cycle budget deliberations. As a result of increases in the President's budget and yet further additions by Congress, NIMA's resources have grown faster than any other program in the IC.

This year NIMA received an increase billed as a "down payment" for TPED. Taken literally, there is hope that NIMA's budget line will increase over the next three years to a point where it can discharge its responsibilities fully. Only upon "payment in full" can the true expectations of NIMA, set back in 1996, be achieved.

On a smaller scale, the Commission observes that NIMA faces a situation of insufficient resource support for its internal infrastructure. In briefing after briefing, the Commission was told, by supporter and detractor alike, that the NIMA infrastructure was not up to the present mission, much less the future. On the positive side, the Commission commends NIMA's plans for consolidation of certain facilities, and lauds progress to date.

# 12. NIMA's Information Systems—TPED At Last!

For the military, decisive force, power projection, overseas presence, and strategic agility will be the strategic concepts to meet the challenges of the future. As first explained in *Joint Vision 2010*, today's military capabilities must transition to dominant maneuver, precision engagement, focused logistics, and full-dimensional protection. The evolution of these elements over the next two decades will be strongly influenced, first and foremost, by the continued development and proliferation of information technologies. Information superiority is the key enabler.

Information superiority—knowing more than enough about an adversary who knows much less than enough—is the key enabler for the practitioners of US diplomatic and economic policy, as well. Geospatial information is nearly always the key to an international engagement, whether on the grand strategic level or at the "tactical" level of flesh and blood and mud. From international borders to artillery aim points, from the flow of goods and services to the mobility of a tank, geospatial information paves the way and points out the opportunities.

Moreover, with the advent of commercially available, high-resolution (less than 1-meter) satellite imagery, the United States has lost the exclusivity it once had. These images will be available, as never before, to any potential adversary. While it may be regrettable, it is not possible (nor even desirable, on other grounds) to turn back the clock. The US answer must be to use its still considerable advantage faster and better. To state the obvious, imagery TPED, in all its dimensions, is the key to "faster and better." Our use of imagery and imagery-derived intelligence must put us "inside the adversary's decision cycle." The importance of TPED for information dominance cannot be overstated.

Everyone agrees that imagery TPED is critical for information dominance; not everyone agrees on just what TPED is!

## 12.1 Defining "TPED"

Literally, "TPED" is an intelligence insider's acronym that stands for "tasking, processing, exploitation and dissemination" and is usually juxtaposed to a specific intelligence collection discipline—*e.g.*, imagery, SIGINT, etc.—or to a specific intelligence collection asset. Thus, we speak of "tasking" an imagery reconnaissance satellite, "processing" its raw collection, "exploiting" its processed collection take, and "disseminating" the resultant information products. Such a recitation, however, may lead one to conclude that TPED is a neat, serial process. It is not.[28]

Nor is TPED a system. There is no single set of engineering specifications, nor will there be. There is no single systems architecture, in the strictest sense. By some lights TPED is a "system of systems" but even that construct is misleading. TPED does embrace a concept of operations from which one may infer certain architectural concepts and, looking to the future, one can substitute newer architectural concepts and modify—hopefully improve—TPED.

Some have suggested that we view TPED as the (real-time) supply-chain management for the Imagery and Geospatial Community (IGC).

Alternatively, think of TPED as shorthand for the ensemble of (people,) systems, and processes that add value to an intelligence collection system. This construct is especially

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[28] Some have suggested that the literal definition of imagery TPED is an anachronism and needlessly constrains our thinking. Alternative constructs are proposed:

**Gathering versus Tasking** –"Tasking," it is argued, stems from a model based on scarcity, where the collector is limited. "Gathering" is a more useful term, deriving from a model based on abundance where discovery is the issue.

**Creation versus Processing**—where a multisensor view of information is contrasted with a single-sensor view of data formation.

**Analysis versus Exploitation**—"Exploitation," it is argued, is an overly narrow Indications-and-Warning (I&W) view of imagery; "Analysis," by contrast, is the function people perform best, seeing patterns in information.

**Sharing versus Dissemination**—where "sharing" is a many-to-many model of information communication, while "dissemination" is a one-to-one, or one-to-many model of data movement.

TPED, they argue, is derogated as needlessly implying a linear view of data. The alternative formulation—Gathering, Creation, Analysis, and Sharing (GCAS)—is billed as a cyclic view of information.

useful insofar as it leads us to question whether a collection system by itself—no matter how technically elegant—is of value commensurate with its cost. The construct also allows us to consider separate elements of TPED functionality and ask, too, whether the value each adds justifies its respective cost.

### 12.1.1 Tasking

Tasking is the value-adding process by which we try to ensure that the right image gets taken, at the right time. If collection capacity is a scarce resource, then tasking includes the optimization of that scarcity. Today—and, arguably for the indefinite future—technical insight into specific collection systems is necessary to accomplish good tasking. Consequently, a corps of trained intermediaries—who mediate between the information needs of intelligence consumers (as well as all-source analysts) and the tasking of collection systems—are, and will remain, a necessary fixture in the TPED process. Despite the intermediation, we must maintain a thread to those whose needs initiated the tasking and provide feedback—ideally with a predictive component—to the end-users as to the status of a request.

### 12.1.2 Processing

Processing is the automated, rote application of algorithms that transform raw collection take into a product better suited for exploitation by a diverse set of analysts and for a diverse set of purposes. There is a continuum between collection, processing, and exploitation. The collector can have embedded and/or "on-board" processing. Or processing can be at a "down-link" site. In any case, there usually are heavy computing demands and consequent economies of scale in processing, as well as a requirement for intimate technical knowledge of the collector. For these reasons, processing is more closely tied to collection than to exploitation, both in systems design and organizational responsibility.

Because the processing "system" has as its input a well-defined collection system specification, and because it controls explicitly its output specifications, it is arguably the easiest function of TPED to architect. Said differently, it largely is isolated from the vagaries of human interaction—"free will" being the archenemy of system architecture. There is a

valid interest in migrating "upstream" into the processing segment those exploitation tasks that can be routinized and automated. This complicates only slightly the processing system architecture.

We might think of processing as the link in the chain that transforms "data" into "information" accessible to human analysts.

### 12.1.3 Exploitation

"Exploitation" is the most abstract of the concepts and, perhaps for that reason, the easiest of the TPED functions to define. Exploitation comprises all those value-adding activities that transform imagery into intelligence or, more generally, the link in the chain that transforms "information" into "knowledge."

Because there are still an infinite number and variety of exploitation algorithms yet to be discovered, one is challenged to devise a meaningful exploitation architecture.

### 12.1.4 Dissemination

Generally, dissemination is thought of, simply, as getting the right information to the right place, at the right time. It is sometimes useful to decompose dissemination into two parts: the physical process of getting it there, "distribution;" and the logical process of deciding "what goes where." Of the two, the distribution historically appears to be the more expensive and difficult, and the most boring. The logical process of dissemination is by far the more intellectually challenging.

## 12.2 If That's TPED, What is USIGS?

Literally, USIGS stands for the United States Imagery and Geospatial Information System: the extensive network of systems used by the Department of Defense (DoD) and the Intelligence Community that share and exploit imagery, imagery intelligence, and geospatial information. These systems provide capabilities involved with the integrated management, collection, production, exploitation, dissemination and archive, and infrastructure of this information. Organizations that have some level of interface with USIGS, but are not part

of DoD and the Intelligence Community, are considered participants in USIGS if they adhere to the technical and system standards.[29]

USIGS includes organizations, doctrine, standards, procedures, libraries, and hardware/software that collectively provide fused imagery, imagery intelligence, and geospatial information.

The Commission appreciates the Director's reformulation of NIMA as custodian of USIGS. Sometimes misunderstood, this reformulation is emblematic of a healthy change in focus, away from systems, away from products, away from processes, and toward information services.[30]

For this report, however, we persist in using "TPED" in deference to the sensibilities of the reader. In most cases, a simple substitution of "USIGS" for "TPED" or *vice versa* works. Thus, TPED acquisition is equated to USIGS modernization, for the most part—*i.e.*, except for purposes of budgetary and programmatic continuity, perhaps.

### 12.3 The Scope of TPED—Why Does It Cost So Much?

TPED is truly a global enterprise that includes multiple suppliers (collectors), operating in different environments, and requiring significant supporting infrastructure. NIMA has (at times) described TPED as a system of systems that will provide the tasking, processing, exploitation, and information dissemination service for all imagery. This includes imagery collected by (theater) airborne assets and by national technical means (NTM) as well as those services provided by Commercial Imagery entities. Commercial services can range from raw images to value-added products and fully exploited information.

Programmatically, TPED more or less includes all the people, hardware, software, communications and "O&M" for the entire Imagery and Geospatial Community (IGC) from the "national" level down to the theater JTF/component level.

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[29] http://164.214.2.59:80/sandi/arch/products/uaf/uaf-b.pdf.

[30] This is not to say that NIMA will no longer produce its hallmark products: maps and imagery intelligence products. As NIMA focuses on information services, the maps and intelligence reports are by-products—intentionally useful derivatives, but not the essence of NIMA.

The approach taken by NIMA is to fully modernize USIGS/TPED rather than incrementally upgrade individual components as necessary to be compatible with the NTM collectors of the FIA era. This comprehensive approach, which demands significant investment, is the only way to transition quickly to the information-centric architecture, which the Commission endorses.

Costs are proportional to a number of factors; among the big swingers are size of the IGC, size of the images, number of images. Note that if an image improves in resolution, say from 1 meter to ½ meter, the storage required, the bandwidth required, and the processing power required *all* go up by a factor of four if the area covered remains constant. But, of course, the area covered might drive each cost up by another factor of four. If the number of images per day increases by several score, these costs, again, rise proportionately. As the uses of imagery and geospatial information become more widespread, the community of users can double. And of course, multiplying all these numbers together, as we must, results in an answer that is large, impressively large, daunting to some. Such is the price of information dominance.

### 12.4 Managing TPED "Operations"

One of the challenges to NIMA is how to manage the significant increase in collection capability that will result from (EIS and then) FIA, and from increasing availability and capability of commercial imagers. Ensuring that tasking is assigned to the right collector is particularly challenging as airborne assets are under theater control, and commercial imagery is subject to the various terms and conditions negotiated with the respective vendors. Ensuring timely exploitation in the face of higher volumes and fewer analysts is challenging, as well. Not to mention ensuring timely distribution over communications channels managed by another agency and procured from various commercial sources.

### 12.5 TPED Acquisition Management

NIMA is not yet well-positioned to acquire TPED (*i.e.*, to modernize USIGS). As a new organization, it did not inherit from its forebears the systems engineering and acquisition personnel and institutional knowledge. This is reflected in lack of a stationary baseline architecture. As we discuss below, growing this competency is particularly difficult in this

economy where the civilian sector easily outbids traditional government organizations for the needed talent; it will require extraordinary measures.

Despite administration neglect, Congress may provide NIMA with the necessary infusion of resources to start innovative TPED architecture work. To take full advantage, NIMA will have to consider innovative TPED "suppliers" beyond traditional aerospace contractors.

NIMA's TPED system is increasingly akin to an information system built for commercial customers by commercial contractors using commercial methods and commercial standards and employing technology to which DoD adds little. True, NIMA's TPED system is not quite identical to anything else (but no sufficiently complex system is without some unique features). It will be huge and girdle the globe, but there are other systems of comparable size (*e.g.*, oil company seismographic records), data complexity (automaker-supplier CAD networks, inventory systems, commercial GIS products, market data warehouses), and reach (many large banks and credit card companies).

Because of the enormous potential for commercial technology, the Commission feels that NIMA should be more an acquiring organization, less a developing organization except in very specific areas such as imagery science. Nor should NIMA take on the role of system integrator. The Commission has not seen evidence that NIMA currently has the expertise or experience to prepare a comprehensive plan to acquire and integrate a system of systems such as TPED. This lack of expertise is exacerbated by the fact that NIMA must migrate a large number of legacy systems while maintaining operations.

As we reemphasize below, the Commission believes that a Technical Advisory Board of outside experts could serve the Director of NIMA well.

### 12.6 The Role of Commercial Technology

As stated previously, the Commission does not believe NIMA is making maximum effective use of commercial hardware and software. It appears to be depending heavily upon its current processes and products and persists in developing government standards that diverge from emerging commercial standards.

While it is recognized that use of GOTS may appear to be the most cost-effective short-term solution, a coherent strategy is needed which balances the use of COTS, GOTS, and customized hardware/software, recognizes the advantages and disadvantages of COTS and GOTS, and plans for the long term. The long-term view is of particular importance because TPED, and USIGS, must be able to infuse new capabilities and technologies.

In addition, it is becoming evident that future capabilities in TPED will be very dependent upon COTS. The Commission recognizes that use of COTS presents new challenges to the government to be a smart buyer and user. NIMA has not shown that it has the necessary expertise and experience to effectively integrate many COTS products into a large system of systems such as TPED.

The Commission stresses that an important step on the road to realizing fully the benefits of commercial technology will be the use of commercial, rather than government standards.[31] Without standards that interface with the commercial world, it will be very difficult to accommodate future products and NIMA will be maintaining yet another obsolete system.

The rationale for COTS products is obvious: they exist, they work, and they evolve quickly as the marketplace expands. Because development and maintenance costs are amortized over many users, COTS products are usually less expensive to acquire. Buying a COTS product worth hundreds of dollars allows the USG to cash in on sometimes millions of dollars of corporate development. Buying into a solution that someone has already devised means less need for reinvention. Being able to "try before you buy" means less likelihood of error. With a large user base, COTS is more likely to be supported by third-party applications, tools, services, and training. And widely used COTS products mean that NIMA and its users can interoperate more easily with each other, with other developers, and with other geospatial data providers.

Not all COTS products are equal. Ideally, if a COTS product is to be considered it must be able to succeed in—that is, ship in volume to—the commercial marketplace. Even better, it

should have evidenced some staying power already, and had the kinks worked out (*e.g.*, version 3.0 or later).

A recent study performed by Aerospace Corporation[32] indicates that the government has yet to develop an effective acquisition model for commercial technology-especially software. Much has been written about the benefits of COTS technology, however, the government, according to the study, has yet to let go of the outdated acquisition and development cycle models that require customization and duplication. NIMA must discipline itself to avoid following a commercial path for only part of the way, then reverting to blind satisfaction of requirements without performing cost and benefit trade-offs.

Will commercial products provide everything NIMA wants? A good architecture ought to make it easy to know whether a given requirement can be so satisfied. As a guess, commercial database and GIS tools are likely to satisfy a very high percentage of NIMA's requirements out of the box. The percentage of analytic tools (*e.g.*, for modeling and simulation) that are commercially available is likely to be far less. When NIMA has a requirement unsatisfied within COTS, it has three choices besides reinventing the wheel: pay commercial contractors to support certain features in these versions, wait for subsequent versions, or make do without. Paying for additional features should be a seldom-exercised option lest COTS acquire the meaning: customized off-the-shelf (often, additional features have to be rewritten every time a new version of the base software is issued).[33]

### 12.7 The IDEX Replacement, IEC, Is a Case in Point

The IEC program—a sad story, but with a potentially happy ending—illustrates the value of COTS products. The Commission has met with imagery analysts who expressed

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[31] As mentioned elsewhere, the Commission is partial to the definition, variously attributed to Scott McNealy, of Sun MicroSystems, that "standards" are products that ship in volume.

[32] *COTS-Based Systems: COTS Software Lessons Learned, Recommendations and Conclusions,* Computer Systems Division, The Aerospace Corporation.

[33] The Commission does offer one caution: increasingly, COTS products are marketed *and* produced globally. This means that a critical COTS product might have been produced by, or within easy reach of, a potential adversary. Information assurance should be a Key Performance Parameter of every significant acquisition.

dissatisfaction with IEC—their complaint is that the IEC's effective, smooth "roam rate" is half that of the system it replaces.

The Commission is perplexed that NIMA would approve, fund, and execute a project to replace IDEX II with a design that, from the start, did not meet one of the most critical requirements for imagery analysis. In addition, the Commission has concerns over the large integration efforts to cobble together various software packages, especially where many of these applications are already available as integrated solutions. Addressing those two issues will likely cause both deployment delays in and cost growth of the IEC program. And the Commission is dismayed that cost of, and or delay in, fielding IEC terminals may impel NIMA to consider purchasing additional mechanical light tables. However, the Commission is buoyed by a recent NIMA initiative investigating a low-cost imagery workstation that meets most specifications, including a faster roam rate, and promises to be significantly cheaper, besides. Other agencies are also aware of this situation and are concerned enough to have started their own in-house programs—clearly a step in the wrong direction and a disappointing development.

Of additional concern is the shift in the commercial world away from UNIX and toward Windows for the very functionality of interest to NIMA. To benefit fully from the COTS cycle NIMA must heed tomorrow's trends, which for client workstation is toward Windows-based solutions and away from UNIX. The cost of high-end Windows workstations is half that of UNIX workstations and the power of graphics engines, fueled by the PC gaming market, is doubling every nine months while the price is being halved. WINTEL[34] hardware and software manufacturers are continuously improving bandwidth and memory access to further enhance performance. So, while capable UNIX designs are currently available, inherent design limitations, less capable graphics cards, and less frequent design improvements, put the current IEC design at a distinct disadvantage, which will only increase with time.

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[34] Windows operating system on a box with "Intel inside."

The Commission also learned that many of the "electronic light table" applications that are critical for imagery and geospatial analyses are now being designed for the WINTEL. In fact, UNIX applications are likely to be offered only if requested and not as an "out of the box" solution.

The current IDEX replacement program is an example where NIMA has taken its first steps to employ some disruptive techniques in its system acquisition model. The IDEX replacement has actually followed two tracks–the first, a more traditional large-scale system integration program in which NIMA has used one of the usual government contractors as a designer, developer, and integrator of the IDEX replacement system, called IEC. IEC was to be a commercially based system. Following the normal large-scale development process, IEC has an expensive design, development, and maintenance cycle, and does not meet the existing IDEX capability. NIMA allowed the contractor to decide that CORBA would be the basis for all interfaces between all devices and processes–data would be passed and handled via CORBA-based ORBs. While the use of object-oriented programming to allow heterogeneous data types and processes to intercommunicate is laudable, adopting an emerging standard that is not commercially viable is not. The commercial world has looked at CORBA and has not adopted it as a basis for commercial systems development. CORBA compliance requires the use and development of additional software to act as the "glue" between the heterogeneous data types and processes. This "glueware" will be one-of-a-kind software, generated by the contractor, tied to a specific vendor's ORB, which must be maintained *in perpertuo*, thereby defeating the original intent of utilizing CORBA. This "glueware" is necessary if and only if the system requires tight integration to overcome a perceived ineptitude of the user. This tight integration is necessary to keep the user from making mistakes. NIMA's users are not inept–as evidenced by their ability to innovate the marriage between IA and GIS tools–and they should be afforded the flexibility to design by discovery.

In parallel to this effort, NIMA sponsored an in-house team to examine whether a *purely* COTS solution to the IDEX replacement could be found. A WINTEL-based system using COTS that are built to the WINTEL application programming interfaces (APIs) was built and tested. It performed as well as or better than both the original IDEX and the current

IEC. (This is an example of a disruptive business model and is to the credit of NIMA, *assuming* it is implemented.) The COTS-based WINTEL solution should not be viewed as a COTS panacea; rather, it should be viewed as being a successful attempt at leveraging the existing base of commercially viable products to solve NIMA's IDEX replacement problem. Now that NIMA has a solution that is in step with the forces driving the commercial market, it will be able to take advantage of the advances that are being made in graphical technology in support of home entertainment. This will also allow NIMA to take advantage of the Web technology that will make it possible for NIMA to leverage its customer base for innovations that will give it the information edge.

Now that NIMA has taken the first step in disrupting its normal acquisition cycle, it must follow this innovative development with an equally innovative deployment plan. Using grand designs to replace other grand designs is unsound in light of current disruptive business models. NIMA should be applauded for using existing commercial standards and hardware and software in its in-house IEC replacement system; however, the deployment of this system will require NIMA to overcome its usual bureaucratic inertia that has plagued its other efforts in both TPED and USIGS.

This implementation should not be just an integration of the WINTEL architecture into the existing IEC as another software set that requires a coating of glue; rather, it should be a replacement for the existing IEC, the deployment of which should be stopped. An independent review board reporting directly to the current D/NIMA should be convened to analyze the existing WINTEL IDEX replacement system. This board–composed of non-NIMA systems analysts–should report to the current D/NIMA on the viability of the WINTEL architecture as a cost-effective replacement for IDEX.

To NIMA's credit it tasked a team to monitor IEC developments and pursue a simpler, less costly IDEX replacement. This netted a lower-cost imagery workstation, based on Windows 2000 (W2K) that meets almost all of the specifications identified for the IDEX II workstations, including a much faster roam rate than either IDEX or IEC. Initially certain

capabilities[35] were not available but as a testament to commercial ingenuity, these have been addressed and resolved. NIMA plans to evaluate this capability by deploying 30 workstations in a joint production cell. Assuming success, NIMA will face a dilemma: it can continue deploying IEC and offer the W2K option or fully compete the two designs, "winner take all". The Commission favors the latter approach.[36]

Use of commercial alternatives places great emphasis on getting the requirements right at the outset and managing the process smartly. The Commission notes that IEC is merely one segment[37] of the IDEX II Replacement Project (IRP), which is managed via an Integrated Product Team (IPT) whose roles and responsibilities do not appear to be explicit. There does not appear to be a consistent understanding of either how the IPT is organized or the level of commitment expected from the various segments and/or users. This is not a recipe for success, irrespective of the use or misuse of commercial technology.

### 12.8 Making Commercial TPED Acquisition Work

Several challenges exist in determining to what extent a commercial approach to TPED would work. A well-defined architecture will prove to be the key to well-placed confidence in commercial alternatives. A check list for success in utilizing commercial alternatives would

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[35] For example, mensuration, display of stereo pair data, and the continuous paging of the data from the server environment.

[36] Data on the IEC and W2K workstation that the Commission reviewed or discussed with various contractors show that the WINTEL workstation hardware would be significantly cheaper (costing no more than $25,000) than the UNIX-based IEC (currently priced upwards of $45,000). Clearly NIMA could field a larger number of workstation or recapitalize at a faster pace than it is planning to. The unsettled debate is in the cost of the software for the W2K workstation. The software costs for each IEC workstation is estimated at about $100,000. It is not clear what the software costs on a W2K would be since the current design has very little integration involved (see CORBA discussion on pg. 97). If no other differences exist, clearly, NIMA could save integration costs and benefit from the economies of scale resulting from using the Windows standard.

[37] Each segment is a separately managed contract, but the relationship of these contracts to the integration contract is not clear. The nature of the delays the IDEX II Replacement Project (IRP) is currently experiencing suggests that the roles and responsibilities for integration were not clearly defined or understood. In addition, it appears that the IRP IPT has limited control over the total life cycle costs (TLCC). As a consumer of components managed via other contracts, the IRP is dependent upon decisions of the segment developers for TLCC impacts. Additionally, the operations phase of the total life cycle includes O&M, which is apparently the responsibility of a sister directorate (Information Services). There was no clear indication that members of this organization participate regularly in the IPT.

include: demonstrating the scalability of the COTS systems under consideration; architectural "elegance," which reduces systems complexity, dependent in turn on identification of good architects; an inclusive, user-informed, prototyping strategy; and a well-vetted plan for smooth transition from legacy systems to new architecture.

### 12.8.1 Does It Scale?

This question is especially important in the database area. NIMA's online database will have a vector and raster component. The vector component is likely to have a high transaction rate but the total size can be easily measured in terabytes. The imagery component is much larger and while its ultimate size is both speculative and highly classified, a planning figure of several petabytes will do. Except for chunks associated with specific features, however, it is likely to have a relatively low hit rate (perhaps no more than 100,000 requests per day). Will COTS solutions to smaller data problems fail to scale? Or, will explicit systems integration be necessary—leaving no good choice but for NIMA to hand its architecture over to a traditional (read "aerospace") systems integration house?

Although NIMA's database is large, in many respects NIMA's problem is simpler than those of other database managers. Smaller databases such as those of banks, credit card bureaus, and server farms have higher transaction rates, more complex transactions, and more input points. A raster-image database may be huge in overall size, but manageable in terms of the number of items; and the transaction rate is low, most client transactions are straightforward (*e.g.*, file calls), and the number of initial data feeds is limited by the number of (expensive) collection systems. No greater than the number of imaging satellites (with airborne collectors the number may approach a hundred). A vector database may have higher transactions rates and more input points but the total data set size is comparatively smaller.

It will be essential to model painstakingly the expected demands on NIMA's database to determine exactly what scalability problems will exist—storage, file complexity, number of nodes, service requests, or the support of specific applications.

### 12.8.2 Is the Design Too Tightly Integrated? Too Complex?

Because it forces developers to produce an integrated system periodically rather than at the end, spiral development encourages light and loose versus heavy and tight systems integration. While the latter may promise to be more efficient ultimately, the former is easier to acquire and maintain; in any event, Moore's law usually rescues the less efficient design.

Reducing unnecessary systems integration also makes the overall effort accessible to more contractors, permits the total task to be managed in terms of smaller and faster deliverables, and ultimately, permits unexpected capabilities and requirements to be accommodated more easily.

The integrating mechanisms of NIMA's information architecture are a common communications stratum (*e.g.*, TCP/IP), a common data model, and a common geodesic model (*i.e.*, WGS 84). Systems integration is to be understood as a light appliqué, not the main event, and certainly not the primary criterion for selecting architects and contractors. And whatever systems integration experience is sought should be demonstrated against at least some significant GIS problems.

Still, one cannot ignore completely the systems integration process that ensures that everything that works apart also works together.

### 12.8.3 Choosing the Right Architects

Should NIMA mount an in-house systems engineering and architectural effort? Can it attract enough talented outsiders through the Intergovernmental Placement Act (IPA) or other programs? Even if NIMA plans to outsource its architecture, the Commission believes that absent some intimate organic capability, NIMA cannot be a sufficiently wise buyer. Absent such expertise, it cannot readily evaluate its own requirements, the architecture that meets its requirements, and the systems that instantiate the architecture. Ineluctably, NIMA must put in place a set of (formal) procedures to validate the architecture.

An architectural goal is to end up with one "TPED" that includes imagery and geospatial data and processes. An architecture that is *data*-centric seems more satisfying to the Commission than one designed around (legacy) products and/or processes.

### 12.8.4 Planning a Smooth Transition—Prototyping and Evolution

Embracing data-centric and Web-centric designs and moving to a new data model could be somewhat perilous. Test beds can play a useful role in validating and instantiating new architectures. Two approaches are possible. One is to run NIMA's architecture and data model off an extant test-bed architecture such as the one being operated by the Open GIS Consortium (OGC). The other is to sponsor a full-up Advanced Concept Technology Demonstration (ACTD). NIMA may want to do both: use OGC (or a like entity) to perform a rapid check on its geospatial model, and use the ACTD to explore the ramifications of a multi-INT database.

Not all of the database's ultimate features need be in place immediately. Some have to be part of the prototype but others can be installed later. Continuous improvement means tomorrow's capabilities are better than today's in some respects, and never worse. Mistakes should be caught while small and young. Feature expansion will await positive feedback. Most important of all, today's satisfied users will not become tomorrow's dissatisfied ones.

During the transition, users should be able to see familiar products—whether originally hardcopy or soft-copy—and it should be easy for someone to "find the button to push" that can recall the same map from the database as before. The period in which old and new coexist is a trying time, but wholesale conversion of NIMA's legacy database at the outset is probably unwarranted; initially, at least, applications should translate legacy data into usable terms (while writing new data according to the data model).

Some data will prove to be worth less than conversion costs because of age, error, or inaccuracies; other data will be found redundant. The rest have to be moved both across media and from the legacy data structures to the newly developed ones. Great care will be needed for those applications (algorithms) that can only work with legacy data structures—here conversion will be less automatic and more expensive.

In many (more) cases, old algorithms, having lost their customers, will simply be dropped. But the rest have to be painstakingly converted.

What should govern when information is to be converted: when it is needed or when it is received? Working on demand leads to crash programs and delays the availability of information (it is usually too late to inspect details up close once a crisis erupts). Working on receipt risks spending money where it is not needed.[38] No easy answers.

Long-term goals can be approached through short steps. Fielding capabilities as they mature rather than at the project's end permits mistakes to be surfaced early and research has shown that early detection of mistakes reduces life-cycle costs. The development of unexpectedly popular features can be accelerated. If something does not work out, one knows early and can adjust requirements (and expectations) accordingly. However, emphasizing periodic improvements places a premium on backward compatibility and changes the training and configuration management regimes. No free lunch, here.

### 12.9 The Current State of TPED

The Commission does not have high confidence in NIMA's current ability to accomplish its TPED system acquisition successfully. The current TPED acquisition effort lacks a clear baseline, which should tie clearly to overall strategy, requirements, and cost constraints. In addition to the lack of a common definition of TPED, there is similarly confusion as to the requirements that TPED must satisfy.[39] The Commission learned that in a comprehensive requirements review that helped define FIA, considerable imaging requirements were allocated to commercial and airborne imagery:

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[38] Of course, if we knew when and where the next crisis would develop, we could forgo the intelligence establishment.

[39] The Commission has labored mightily to get this right. It's not easy. We think we are close, but each time the question is posed, the sands shift. It is legitimately difficult to gauge requirements: some requirements are point targets, others are for area coverage; not all point targets are equal, not all areas are equally interesting; peacetime is different from wartime. Complicate this by the fact that some require higher resolution, some require stereo, *etc.* Without making this a life's work, one may still conclude that there will be a disconnect if airborne and commercial do not deliver as originally anticipated.

> In peacetime less than 50 percent of required area coverage is allocated to FIA, while commercial and airborne assets accounted for the majority of peacetime area allocations. For peacetime point coverage the reverse is true, with the bulk of peacetime point targets allocated to FIA, and a minority to airborne and commercial assets.
>
> During a major theater conflict, about half of both area and point coverage are allocated to FIA, while commercial and airborne assets combine to meet the other half of all requirements.

FIA holds to the claim that it will meet all its allocations; however, because of negligible budgeting to date for commercial imagery, and proposed reductions in airborne investment, OPSTEMPO and PERSTEMPO—the FIA era still might not live up to its billing as eliminating collection scarcity. Further, the allocation of requirements to airborne sensors implies a concept of operations (CONOPS) that has not yet been articulated. Compounding the problem further still, the Commission could find no credible plans to integrate commercial and airborne products into FIA and/or TPED. Without agreement within the community of what is included in TPED and what requirements are to be met it is difficult to envision a successful acquisition effort.

The Commission received a number of briefings meant to describe TPED and its status. What becomes clear is that NIMA has not articulated a single definition of TPED. One is easily confused about where TPED ends and USIGS begins, or are they one and the same? Does TPED, as specified, support only the collectors that the NRO is acquiring under FIA, or does it also embrace airborne and commercial collectors? Does TPED extend to multi-INT capabilities? These, and other, ambiguities suggest those responsible for its implementation do not adequately understand TPED.

It appears that an acronym for the functions of tasking, processing, exploitation, and dissemination has somehow become the name for an entity without benefit of a common understanding of the content. TPED needs stability in definition and scope (and funding) so there is a common ground for describing and successfully implementing the capabilities needed to support the users. The Commission was treated to a multi-phase view of TPED by ASD(C3I) which clearly shows, in successive phases, the integration of commercial and

airborne imagery assets, and multi-INT integration. If fleshed out, funded, and adhered to, the plan seems satisfactory to the Commission.

In addition, NIMA's current acquisition strategy requires NIMA to be its own system integrator. However, the Commission is not confident that NIMA currently has the system engineering experience, acquisition experience, appropriate business practices, and performance measures to so acquire TPED systems. The Commission sees high risk in NIMA's taking on responsibilities and risks above and beyond that of a simple acquisition agent. But, as argued earlier, NIMA must have sufficient organic capability to be a wise buyer.

As discussed in a preceding section, the Commission observes that TPED is not adequately utilizing commercial hardware and software. Again the Commission is somewhat conflicted as to whether or not NIMA should restrict itself to an acquisition role, ceding most development and systems integration activities.

The Commission observes that current TPED plans only tangentially increase the convergence of imagery and geospatial processes, and also notes that current TPED plans do not effectively integrate airborne and commercial imagery with national technical means. Nor do current TPED plans speak to the issue of multi-INT integration.

As an aside, the Commission notes that the FIA baseline does not support production of film, on which TPED must still rely unless NIMA receives additional resources to move the entire community to soft-copy.

### 12.10 The Need for an Extraordinary Program Office

The imagery TPED program increasingly strains at the fabric of the NIMA organization as a whole. Repairing the problems cited above, while necessarily adhering to the schedule imposed by the successive generations of imagery satellites—EIS and then FIA—makes the current program far more risky than previously supposed. While we cannot afford to fail, it is not clear that we are prepared to afford success. The stakes are high, the job is

monumental, the time is short, the resources are marginal, and the skilled personnel are slim pickings.

NIMA does not have the organic capability or the experienced technical leadership to successfully acquire TPED, nor can it "get there from here," in time, using normal government practice. There is no help on the horizon because neither the NRO nor NSA has the talent to spare. If the US is to have a good chance of achieving a TPED capability to give the nation the information edge in the 21st century, special steps must be taken to ensure success.

The Commission recommends creation of an Extraordinary Program Office (EPO) armed with special authorities of the Director of Central Intelligence and the Secretary of Defense, augmented by Congress, and staffed beyond ceiling and above "cap" through an heroic partnership between industry, NIMA, and the NRO. The EPO, to be constituted within NIMA from the best national talent, shall be charged with and resourced for all preacquisition, systems engineering, and acquisition of imagery TPED—from end to end, from "national" to "tactical". The first milestone shall be completion of a comprehensive, understandable, modern-day "architecture" for imagery TPED. Other provisions of law notwithstanding, the Congress shall empower the Director of the EPO to commingle any and all funds duly authorized and appropriated for the purpose of the "TPED enterprise," as defined jointly by the Secretary of Defense and the Director of Central Intelligence.

### 12.10.1 To Establish the Baseline Architecture

An accelerated schedule helps avoid mission creep. The Commission estimates that the first four months should see (1) a preliminary data model constructed, (2) estimates of the time and resources required to convert legacy data into standard digital form (see below), and (3) a succinct requirements statement based on the principles above. Architect selection should proceed expeditiously with the actual work completed in three phases of six months each. The first phase should be specific enough so that the work of converting legacy data can begin. The second phase should be good enough to budget the next five years of TPED acquisition. The last phase should be the basis upon which software can be written and acquisitions begun.

### 12.10.2 To Migrate Toward a Data-Centric, Web-Centric Design

TPED should not be based upon NIMA's current processes and products. Instead, as elaborated upon in the succeeding section, processes should be considered as Web-enabled transactions against a database; products can be pulled from the database or created by "servelets," "applets," and/or client software. The design should inherently foster imagery-GIS convergence.

### 12.10.3 To Integrate Airborne and Commercial Imagery with NTM

The Commission has not seen evidence that an integrated plan exists that utilizes airborne, national, and commercial imagery in a cooperative effort to meet all imagery collection requirements. In addition to the comments above concerning requirements allocation among the various collectors, the Commission was not exposed to an integrated CONOPS utilizing imagery from all three sources—national, airborne, and commercial. Such a CONOPS requires close coordination with CINCs who currently have control over theater assets. An operational plan would also require agreement with commercial providers on issues such as amount of imagery to be provided, quality control, responsiveness to USG needs, and methods of exploitation.

Further concerns about the lack of integration among airborne, national, and commercial imagery are made evident by the fact that the TPED functions; namely, tasking, processing, exploitation, and dissemination for each of these imagery providers are essentially different. The fact that NIMA has not discussed these functions individually nor indicated how these functions would be accomplished for each imagery source in a cooperative environment is an indicator of the lack of an integrated plan.

### 12.10.4 To Integrate Libraries and Communications

Dissemination (including the communications for distribution) is arguably one of the more expensive portions of the imagery intelligence cycle. One of the critical elements of this service is the communication links. These links connect tasking authorities to collectors, collector data to processors, processors to exploiters, information to users, and users to tasking. These links must be secure, robust, high capacity, and both long and short haul.

It appears to the Commission that the lines of responsibility between TPED and communications systems, both terrestrial and space, have been blurred. The danger in this approach is that no one becomes responsible for the enterprise operating as a unit. The dialogue so far between NIMA, DISA, NRO, and the user community engenders no confidence that the links will be there when needed. It was not made clear to the Commission as to who has responsibility for the "last tactical mile." It does not appear that NIMA signed up for that responsibility—and it certainly is not resourced for that, nor should it be from "national" funds, by some accounts. However, the CINCs and Services conveniently profess not to know where TPED ends. This is not good.

Clearly more dialogue is needed to define the boundaries of TPED, responsibilities, and interfaces. Part of the difficulty in having this dialogue is that communications is considered both multi-user and multi-use; it is expensive given the bandwidth needed for imagery and geospatial product delivery—in fact, once imagery-quality bandwidth is provided, almost everyone else "rides for free." The Commission is uncertain whether an Intelligence Community communications architecture exists.[40] The Commission is pretty certain that if it does, it does not stretch to the foxhole, wheelhouse, or cockpit. While such architecture is not necessarily a NIMA responsibility, it is necessary for TPED to be successful. Given this situation, it is difficult for the Commission to have confidence that the capacity for FIA and/or USIGS will be available when needed.

### 12.10.5 To Support Multi-INT TPED

Despite the fact that material describing USIGS implies use of, and integration with, other Intelligence sources such as SIGINT and MASINT, the Commission found little evidence

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[40] By some accounts, the Defense Information Services Agency (DISA) is responsible (for DOD) end-to-end architecture; indeed, DISA's Global Information Grid (GIG) presumes to extend across the last tactical mile, although the Services have not yet been heard from on the notion. Even if DISA harmonizes with the Services, the situation is clouded by the fact that intelligence networks have traditionally been separate from DISA networks. They can run at a higher classification and, given the out-bound imagery bandwidth requirements and the in-bound SIGINT requirements, intelligence traffic would dominate by far a common use network. For these and other reasons, the Intelligence Community has been noticeably reticent in placing its future in DISA's hands.

that integration is inherent in the TPED program.[41] Solutions to portions of the imagery problem set generally require the integration and fusion from all sources with very short timelines and the Commission agrees that all-source TPED is needed. Multi-INT requires as a minimum the following elements: tasking processes based on required information rather than INT-specific observables; interoperability between TPED systems, MASINT, and SIGINT information embedded in the USIGS library; and multi-INT workstations equipped with exploitation aids.

A review of the current operational and planned space and airborne capabilities indicate efforts to support TPED functions within each discipline with little planning for integrated systems or functions across the current stovepipes. The NIMA TPED program does not fully address this problem. Moreover, there is some question if NIMA has the authority, expertise, and budget to execute the necessary programs. As a minimum, NIMA should have complete understanding of the relevant programs that its mission partners and others are pursuing and efforts made to coordinate these efforts. The Commission was not exposed to relevant TPED efforts at NSA and CMO regarding SIGINT and MASINT nor did it hear of cooperative efforts among NIMA, NRO, NSA, Central MASINT Office (CMO), or others for multi-INT TPED other than plans to develop a shared requirements database.

### 12.10.6 To Address TPED Implications of JCS-Identified FIA Shortcomings

There are five significant FIA shortfalls defined by JCS that have major TPED implications and have not been considered in the current architecture. Without going into the specifics, which are classified, the Commission wants to plant the marker that augmenting FIA with any or all of the shortfall-capabilities must also provide for the TPED implications of the FIA improvements. In the spirit of Total Cost of Ownership (TCO), the Commission expects the bills for the upgrades to be calculated taking TPED modifications into account, and budgeted for as a piece.

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[41] However, the multi-phase view of TPED espoused by ASD/C3I clearly shows multi-INT integration as a later phase. As the C3I vision becomes better defined and funded it will alleviate Commission concern.

### 12.11 Creating the EPO

The special authorities of the DCI should be used to create the "spaces" and the DCI and SECDEF should intercede personally with the private sector to get the "faces" to fill those spaces. Congress should codify the exceptional measures needed to set up and operate this Extraordinary Program Office (EPO). The Commission believes that the EPO should be created within NIMA.

It is anticipated that the EPO shall have a five-year lease on life, after which the Director of the EPO and D/NIMA will have arranged for a smooth transition of the required capabilities into NIMA proper.

Elements of an EPO;

- ✓ Confer the special authorities and organization to make the EPO architectural development viable.
- ✓ Recruit a national team of expertise for at least a three to five year period.
- ✓ Institute a world-class system engineering and information technology capability.
- ✓ Install an effective procurement and contracts capability commensurate with EPO.
- ✓ Assure that the aerospace industry does not dominate the business of EPO.
- ✓ Adopt the most effective government/commercial programmatic tools on a priority basis.
- ✓ Simultaneously build an in-house SE/IT capability in NIMA for the longer haul.
- ✓ Oversee TPED and R&D as related but separate programs, *i.e.* strong R&D that is not raided by TPED development.
- ✓ Use a sound business plan as the basis for EPO activities.
- ✓ Assure the architecture is in line with the Strategic/Organization/Management considerations.
- ✓ Give priority to sorting out consistent approaches to IEC and OET/WPF.

- ✓ Ensure that EPO architecture is not proprietary but is based on open systems.
- ✓ Assess the scope of integration of new technologies associated with new collection techniques.

### 12.12 Technical Advisory Board

The Commission feels that the Director of NIMA would benefit from outside technical expertise, in the form of a Technical Advisory Board with whom he might meet periodically to review key TPED acquisition (USIGS modernization) milestones and top-level design presentations. The Board would also represent a resource on which the Director and his senior acquisition and technology officers could call as required.

# 13. NIMA Research and Development: A Road Less Traveled

NIMA inherits from its forebears, principally NPIC and DMA, a spotty record in research and development, which was largely done by others on behalf of these organizations. Inasmuch as the Commission recommends that NIMA be an "acquiring" organization, versus a "developing" organization, it is hard to argue for an in-house R&D capability of other than the most modest proportions. Nonetheless, there is considerable merit in looking over the shoulders of those who do research and there is considerable research and development that could profitably be undertaken to support NIMA's mission. It is important, then, that NIMA be an smart sponsor for such R&D—smart in the sense that it knows, generally, what technological breakthroughs will advance its mission, and that it has some plan for technology insertion if and when R&D delivers.

The Commission is quite concerned about the level of research and development conducted by and on behalf of NIMA. Imagery and geospatial activities in the national security sector are only partially congruent with those of interest to the commercial information technology sector. The Commission is convinced that inadequate R&D holds hostage the future success of TPED, USIGS, and indeed of US information superiority. Here, we provide some examples of areas where NIMA, and its R&D partners, need to be cognizant, if not involved directly with advanced technology.

Specializing in the higher value-added aspects of TPED will ultimately require NIMA to do more technology. Maps and electro-optical images are readily understood, the former through tons of experience and the latter through analogy with the human eye. Even multispectral imaging (MSI) is just a color image. But by the time one gets to the fine spectral slices of hyperspectral imaging (HSI), much less ultraspectral imaging (USI), analogy to human experience thins. One needs, for instance, a thorough catalog of objects and surface chemistries to detect the meaning of this or that reflection. This also holds true for sophisticated synthetic aperture radar (SAR) interpretation. Even more technology is necessary to defeat the natural effects of atmospheric distortion or the deliberate effects of

denial and deception. Further research is also warranted for ground and air moving target indicators (AMTI and GMTI) technology, which, when combined with SAR technology, might possibly provide innovative ways to find targets such as SCUD TELs, for example.

Speed (faster cycle-times) is another potential area of competitive advantage that can be enhanced by technology. An enormous ground infrastructure helps NIMA bring large volumes of space-based imagery to earth quickly. But further networking and error-correction technologies are required in order to fulfill the promise of sensor-to-shooter, or more so, sensor-to-seeker–especially if NIMA is required to provide informed, real-time input without slowing the decision loop. Similarly, distributed access–the ability to get product into a variety of devices by taking proper account of their limitations (e.g., a palmtop's limited screen and memory)–is another potentially rich technology thrust area. Techniques to recognize targets or detect changes automatically can permit analysts to examine much larger swaths of territory and defeat an enemy's strategy of hiding in the vast open. Similar techniques and technologies can also counter an adversary's strategy to hide what he is doing through denial and deception.

In the very near future, third generation wireless handheld devices will be available with much higher data rates, digital and voice data, integrated with or connected to GPS, Intel and other CPUs, laser range finders, azimuth indicators, map and image display devices, etcetera, making the sensor-to-shooter-with reachback technologically achievable. The Joint Expeditionary Digital Information program has demonstrated many of these interconnected capabilities with second-generation wireless devices. Experiments with this program at Fort Polk during the Army Warfighter Experiment were, on balance, very successful in demonstrating the promise of this sort of capability.

The DoD vision of joint fire against time critical targets requires imagery and geospatial communication "with the foxhole" (weapons system, platform) in order to provide the georeferenced updates that are essential to the Common Operational Picture (COP). NIMA, with its obvious vested interests, should have a technological leadership role in this area.

Geospatial precision is another current and potential strength of NIMA. The ability to render operational areas in three dimensions supports a simulation ability good enough to be considered virtual reality–and indispensable for preparing warfighters for difficult missions. Accurate digital elevation modeling permits closer nap-of-the-earth flying, an increased ability to use terrain to mask or unmask operations, and better weaponeering. Accurate geolocation and mensuration can enable new generations of fire-and-forget weapons with less risk of collateral damage. New instruments, greater sophistication in their use, and the innovative use of knowledge bases can yield substantial gains in accuracy.

NIMA should aggressively explore ways to realize the large potential for improving effectiveness through the "force multiplier" opportunity in automated extraction tools for both geospatial and image analysis.

In general, NIMA ought to be led more aggressively in the search for collaborative relationships with all organizations doing imagery and geospatial R&D including the CIA, NRO, CMO (Central MASINT Office of DIA) and even civilian agencies (e.g., DoE's weapons detection software, and NIH's image-extraction from mammography research) as well as public and private corporate high-technology institutions (e.g., Charles Stark Draper Laboratory, MIT, Stanford and commercial contributors).

But tracking and performing R&D across such a spectrum requires funding. The Commission finds that NIMA's current budget for R&D is far from adequate, and the Director of NIMA is committed to trying to increase the NIMA R&D account. The Commission agrees that a larger percentage of the NIMA budget should be devoted to R&D, once the overall budget realistically is consonant with the mission. To set a benchmark, the Commission notes that the NRO's Directorate of Advanced Science and Technology (AS&T) has a firm claim on 10-percent of the NRO's resources. The Commission strongly believes that D/NIMA should direct that creation of a technology road map to encompass the domains discussed above. It may not matter whether the R&D is executed within NIMA or is contracted out to centers of excellence in various organizations under NIMA's direction.

While the Commission did not dwell overly long on a search for technologies that could materially improve NIMA's prosecution of its mission, it does offer the following table of technologies that, on the surface, at least, could be profitably pursued. In fact, there are few if any surprises in that table, and many of the topics are addressed at some level at various times.

**Technologies That Can Provide the Edge**

| | |
|---|---|
| Multispectral Imagery (MSI)<br>Hyperspectral Imagery (HSI)<br>Ultraspectral Imagery (USI) | MSI, HSI, and USI are technologies to collect precise imagery of successively finer spectral resolution. The NIMA advantage would be the ability to extract useful information from images otherwise unremarkable to the human eye. |
| Synthetic Aperture Radar (SAR)<br>Ground/Air Moving Target Indicator (MTI) | SAR and MTI permit all-weather day-night imaging of objects and detection of those which are moving. The NIMA advantage would be processing such information to find and characterize mobile targets in real time. |
| Ground Infrastructure<br>Space Relays | They permit large and fast dumps of data from space and the ability to circulate such information in quantity once landed. The NIMA advantage would be greater collection (because storage between drops is less a constraint) and faster image processing (thanks to fast picture-cleaning and because satellites are in more frequent contact with the earth). |
| Sensor-to-Shooter<br>Sensor-to-Seeker | Real-time linkages from sensor assets directly to warfighters or weapons, respectively. The NIMA advantage would be the ability to strike targets while at or near where they are found (or can be predictably tracked to). |
| Distributed Access | The ultimate expression of NIMA-in-a-box; imagery intelligence and other GIS information to the foxhole (or cockpit, or CIC). The NIMA advantage would be the ability to give warfighters exquisite situational awareness and precise targeting. |
| Automatic Target Recognition (ATR)<br>Automatic Change Detection | They permit large images to be scanned by computer with relevant details (*e.g.*, targets, changes) picked out. The NIMA advantage would be the ability to process large areas quickly (*e.g.*, to find SCUDs or detect potential nuclear detonation sites). |

| | |
|---|---|
| 3D Virtual Reality | The ultimate mission-planning tool. NIMA's advantage would be the ability to insert accurate three-dimensional GIS data (*e.g.*, urban data, imagery atop topographic data) to permit mission testing, and rehearsal on the fly. |
| Counter Denial and Deception (D&D) | D&D permits adversaries to hide or fake what they are doing from sensors. The NIMA advantage would be the ability to defeat such strategies. |
| Digital Elevation Modeling | Deep detailed knowledge of the earth's surface. The NIMA advantage would be in supporting terrain-following weapons (*e.g.*, cruise missile TERCOM) and terrain-masking tactics (*e.g.*, used by Apache Longbow), and one day, more effective urban operations. |
| Geo-location and Mensuration | The ability to locate and measure objects precisely. The NIMA advantage would be the ability to do so without ground reference points. |
| Automated Map "Finishing" | Anything that would permit automatic finishing would not only save man-hours, but permit NIMA products to appear at intermediate resolutions (*e.g.*, 1:100,000 rather than just 1:50,000 or 1:250,000). The ability to update data sets from imagery without human intervention would be helpful when supporting operations with timelines measured in hours and days. |

# 14. NIMA and Its Information Architecture—A Clean Sheet

As mentioned previously, the Commission is enthusiastic about the Director's reformulation of NIMA as custodian of the US Information and Geospatial Service (USIGS). Sometimes misunderstood, this reformulation is emblematic of a healthy change in focus, away from systems, away from products, away from processes, and toward information services. This is not to say that NIMA will no longer produce its hallmark products: maps and imagery intelligence products. As NIMA focuses on information services, the hardcopy maps and reports are byproducts—intentionally useful derivatives, but not the essence of NIMA.

A critical consequence of the reformulation is the need to get the information architecture just right. Otherwise, the future extensibility of USIGS will be severely limited. New applications will not be able to flower.

A sub-panel of the Commission took a look at a possible architecture unconstrained by any legacy issues—a "clean sheet" was the starting point for a top-level design exercise. The conclusion of the sub-panel, endorsed by the Commission as a whole, is that to support NIMA's transition to an information service, the USIGS information architecture must become "data-centric." To anticipate the discussion, this means that all TPED processes—and subsequent analytic processes, as well—become transactions against the database, each deriving value from, and adding value to, the database.

## 14.1 The Importance of Architecture

The importance of focusing considerable energy on NIMA's information architecture cannot be overstated. NIMA is embarked on a major acquisition initiative for its tasking, processing, exploitation, and dissemination (TPED) process, which will, for better or worse, solidify its information architecture for a decade or two to come. The Commission fears that, left to its own devices, NIMA's information architecture could well remain system/function-centric, structured around discrete systems purchases made several hundred million dollars at a time. While these systems could be individually coherent, and would likely meet current stated

requirements, they would neither position NIMA to take full and continuing advantage of the revolution in information technology, nor interface gracefully to systems and processes as yet unimagined.

To oversimplify slightly, the Commission is inclined to believe that TPED and other major applications would be best served if NIMA were to develop a new architecture, a new process by which to acquire this architecture, and a new organizational form to take advantage of it. The new architecture would be built upon a distributed database that integrates geospatial and imagery information—and can extend to encompass information derived from other "INTs". The new process would adopt COTS to the maximum useful extent, built in terms of periodic increments, and cut back on requirements for systems integration. The new organization would focus NIMA on its emerging role as content provider for the Global Information Grid (GIG).

It is with temerity that the Commission offers for consideration this more detailed discussion, not to provide a blueprint, but to illustrate how fundamental changes in architecture create fresh possibilities—yes, and raise new issues. It should neither be accepted uncritically, nor discarded petulantly. It should serve merely to illustrate how rethinking TPED without preconceptions can inform the structure and composition of NIMA's information systems, and indeed, NIMA itself. The Commission realizes that insofar as there are sound ideas here, they are neither unique to the Commission, nor absent in NIMA's own thinking.

### 14.2 Toward a New Architecture

Only half jokingly has NIMA, in its current configuration, been described as "two communities separated by a common agency." Imagery analysis, with its intelligence heritage, is quite comfortable with its functionality allocated as TPED. Geospatial analysis, with its cartographic heritage, is less well served by the TPED nomenclature and more at home with order entry tracking (OET) and work flow management (WFM). While either argot could be adapted to (or adopted by) either community, the data-centric construct accommodates both. The Commission cautiously asserts that beyond being an inclusive construct, data-centricity is a unifying construct.

NIMA is perched on the edge of a systems acquisition that will influence its information environment for years to come. This provides NIMA with a unique opportunity to consolidate

its information architecture. The Commission believes that NIMA's information infrastructure should be *built around an integrated data architecture, not around a collage of systems, nor products nor processes.*[42] Actually, the Commission's view is grander still. If done skillfully, NIMA would become the architect, if not the custodian of the Geospatial Information System for the larger national security community—intelligence and operations, diplomatic and military, strategic and tactical.

This "mother of all databases"[43] at the center should be the conceptualization, if not the container of all the national security community's geo-referenced (and time-tagged) information.[44] Indeed, nearly all relevant information is, or could profitably be geo-referenced. "The Central Database"—which need be neither singular nor centralized—must be widely and easily shared among users and, in the first instance, should hold vector data (the stuff of maps) and raster data (the stuff of images) as a seamlessly packaged whole. The database should be structured to be independent of client or application, fully distributed, and capable of accepting successive value-additions and user annotations. These features would depart from NIMA's current information architecture (though some of NIMA's as-yet-unimplemented plans pull in that direction).

### 14.3 A Database to Support the TPED Process

As shown in the accompanying illustration, such a database could constitute the primary—not necessarily sole—support for the imagery TPED process; indeed, it would support any number of TPED processes as such.

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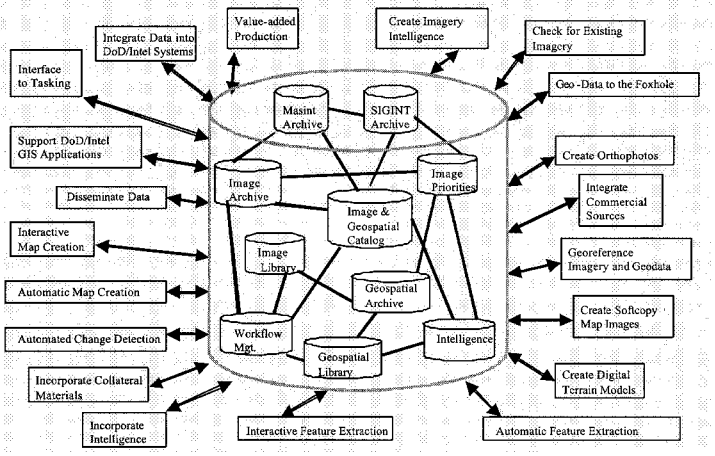
[42] Advocating that NIMA develop a data-centric architecture rather than a system-centric, product-centric or process-centric architecture may seem, at first, to run counter to today's government and business practices. Normally, one first determines the business processes critical to the organization and then designs an information system to meet these. For NIMA, though, *information is the product*.

[43] With apologies to Bran Ferren.

[44] It will be worth exploring whether, and to what extent, the MIDS-IDB database administered by DIA should form the conceptual core of a new data-centric architecture.




All TPED functionality—from requirements and tasking, to data reception, processing, exploitation, and dissemination—can be seen as transactions against a database. That this database may be parsed, distributed, replicated, aggregated, and so on is key. Transactions—the value added to data in the database—need not adhere to the sequential implications of traditional TPED interpretation.

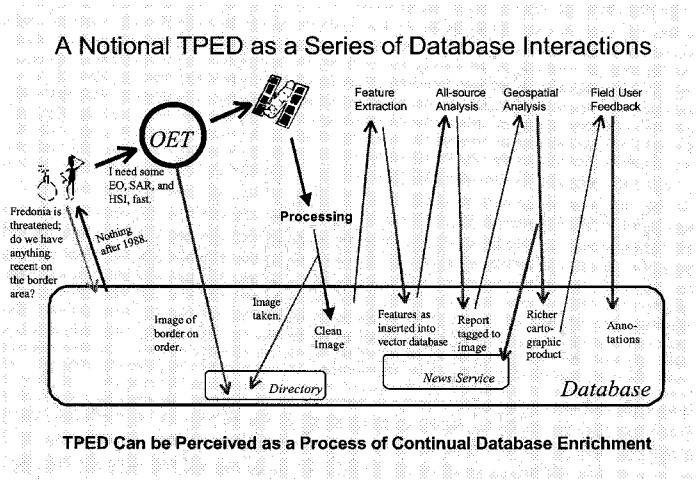
### 14.4 Tasking, Processing, Exploitation, and Dissemination as Transactions

Tasking flows from an expression of information needs and logically starts with an investigation of what already exists---Are the data in a database? Is the product already in inventory? If so, pull it. If not, order it. Ask that it be pushed to you, or ask to be advised as to when it is available to be pulled. In the "back office" the order is processed—pulled from a queue, or pushed to the fulfillment process. Different views—depending upon whether one is in front of the counter or behind the counter—which can be reconciled as transactions against a database. Much can be relegated to server applications: notification, standing taskings, and the like.

Processing, in the first instance, refers to turning the information downlinked from the satellite (in what we might refer to as a "proprietary" format) into a "picture" ready for

exploitation, on film or on soft-copy. Processing operations are, generally, done for each picture and so it makes sense to do these prior to the exploitation phase, on large capable hardware close to the downlink entry point. If and when exploitation operations become so routinized that they can be done automatically—say, change detection—then that process might well migrate from the exploitation segment and move "upstream" into the processing segment. In organizational terms, this could mean that NIMA cedes control and execution of these processes to the National Reconnaissance Office (NRO) or commercial operator. No matter who, insofar as the original downlinked information is archived, then successive processing operations can, too, be seen as transactions against a database.

In the same sense, the succession of value-added exploitation steps can be seen as transactions against the database. The (copy of the) image is pulled from the database, value is added, and the modifications and/or modified picture are written back into the database. Thus, exploitation can also be seen, as in the accompanying figure, as a series of transactions (involving imagery but also related vector information), which can continually enrich the database with new features (*e.g.*, a newly discovered double-perimeter fence line) and annotations upon old features.

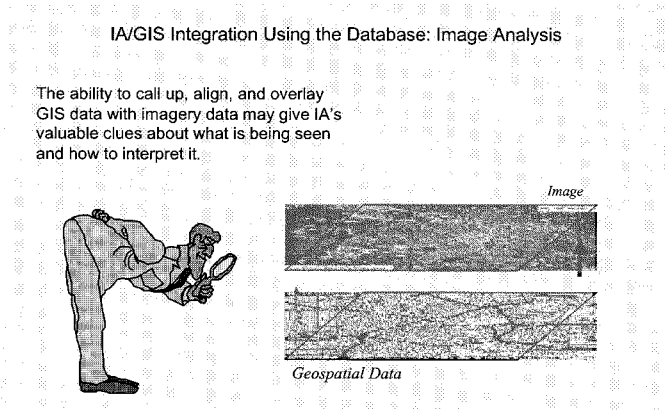


Dissemination—the intellectual task of deciding to whom information should go, as distinct from distribution, which is the process of carriage—entails both "push" and "pull." In the former case, a background process—driven, say, by tables that codify users' expressions of needs and wants—runs against new postings to the database and sends that information, or a notice of new information to the desirous users. In the pull case, users run queries against the database holdings. Indeed, if the query language allows the user to specify not only how far back in the archive the search should be conducted, but also how far into the future, the distinction between push and pull logically disappears.

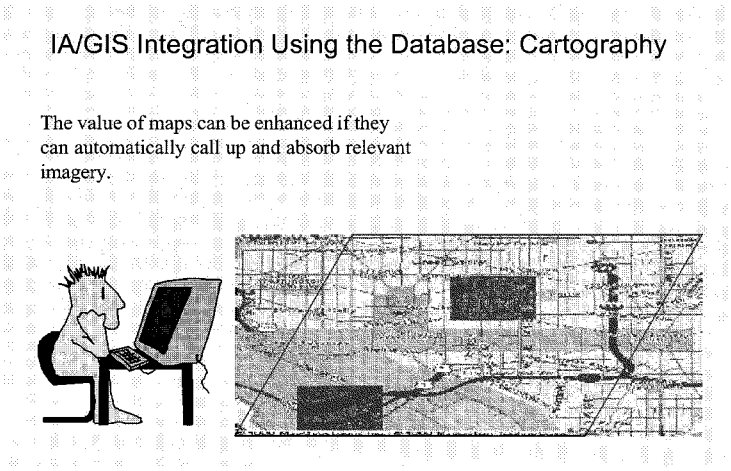
We have taken the liberty, in the preceding discussion, to pretend that there is actually one integral database. That need not be the case, and some would argue that in terms of implementation, no one database could possibly satisfy all. But, the master geo-referenced database still holds its position as the logical source of and sink for NIMA work.

### 14.5 Vector-Raster Integration

The NIMA database ought to permit clients to access vector and raster information in an integrated fashion—*i.e.*, "normalized" to each other so that the user can drape one over the other seamlessly and transparently. As the accompanying figure suggests, image analysts themselves may be able to do their jobs better by being able to see "through" images into underlying geospatial data (or take advantage of geospatial analysis that may indicate, for instance, likely hiding areas for SCUDs; see *A Tale of Two Cities*, elsewhere in this report).




Today, such a database would naturally contain "chips" of an image—*e.g.*, polygons containing interesting pieces of the larger image. Today, the polygon would be determined by geospatial coordinates—say, a rectangle 2km by 3km centered on a set of geo-coordinates, the "aim point." Eventually, we can expect the chips to be determined more by imagery content—a building, or a compound, or the right-of-way along a road. In either case, a goal is to accommodate better the "bandwidth-challenged" user—fielded forces, those at sea, or airborne. Even with conventional compression, the "last tactical mile" generally constrains us from sending full-size images, which will, themselves, get larger with the next generation of imagery satellites just about as fast as bandwidth will increase. So, the ability to combine vector-map data (which are generally compact for the area covered) with imagery extracts of key visual features, may be the best of all worlds.




### 14.6 Product, Application, and Client Independence

For many users, NIMA still is defined by its catalog of standard map products, paper or CD-ROM.[45] The Commission believes, however, that such products are better thought of as renderings of datasets extracted for specific purposes from a larger database. Users themselves create "products" from the database that NIMA provisions. A "standard" product becomes one where a script has been generated to ensure some uniformity in the data extraction and rendering.

Where once NIMA's job was to make maps, tomorrow its job will be to provision the database and ensure the availability of applications that enable a user (or another application) to call for data using a combination of coordinates, scale, feature sets, and in some cases, currency (what time period is relevant) from an integrated database. Data should be accessible through multiple methods, as shown in the accompanying figure. GIS data can also be used (and thus should be formatted to easily be used) as an input to planning, modeling and simulation, and planners may be able to exploit the database without ever having to see a map or an image.

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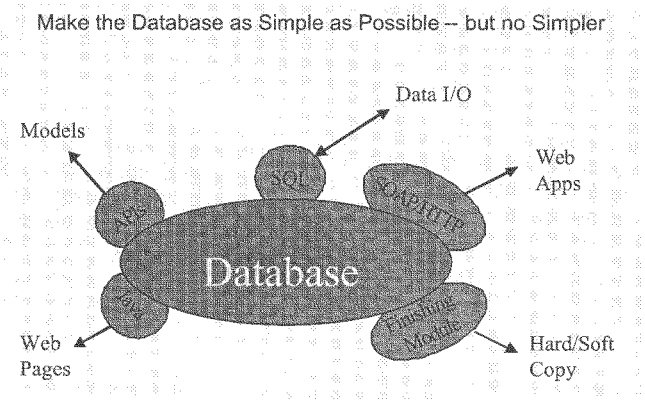
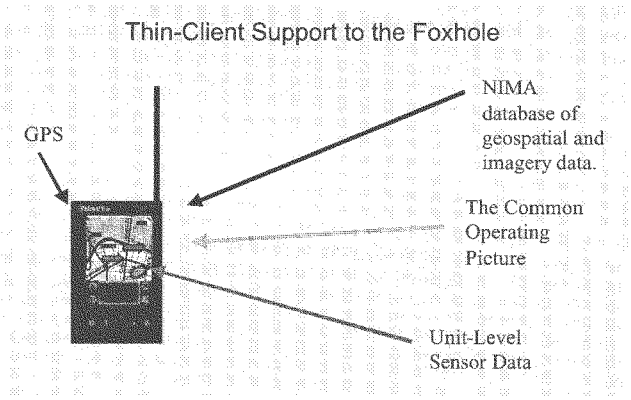
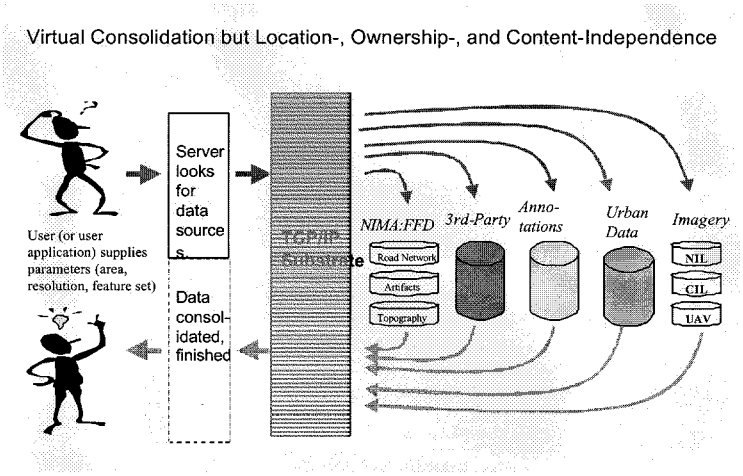
[45] There were 283 products at last Commission count.




The ability to call on NIMA's database through standardized function calls should be a capability that others can build into their products. The separation of client and server functions through modular interfaces also eases the systems integration problems (the importance of which is discussed below). Support must be provided for both thick clients with software powerful enough to manipulate and finish the product and thin clients which can only display a map as a picture but cannot manipulate it as data. Overall, the user interface should be a function, not of the database, but of the user's requirements.



Making GIS data broadly accessible via standard protocols permits anyone to build new applications for users. This frees NIMA from having to guess how its data will be used, and allows unanticipated uses to flourish. The data provider simply cannot be prescient enough to anticipate all the uses to which the data will be put. Traditionally, however, data can be seen only through conforming applications, and manipulated only through routines built into the applications themselves. The software behind the Common Operational Picture (COP: the real-time view of the battlefield), for instance, has no macro language. Best commercial practice, however, avoids this dead end, and so, too, must NIMA.




## 14.7 Location Independence

The "NIMA database" can (and should) be distributed both physically and virtually. As the accompanying figure illustrates, it suffices that one node "know" where all the relevant data sits; the many data streams that go into a GIS system may sit in various locations (and be managed by various owners within and without NIMA) as long as their interconnections—through the GIG, say—are sufficiently robust. Storage, communications and processing all trade off against each other and best effect can be achieved when a single architect has the freedom to make all the tradeoffs—*i.e.*, to globally optimize the network design.

"Ownership" of data ought to be divorced from locality. There is no need to invest the CINCs with responsibility to hold and manage a set of images taken with national assets over its AOR (area of operational responsibility); it is not even clear that information acquired with theater assets (*e.g.*, UAVs) ought to be part of an exclusive CINC image library as well. True, leaving the command image libraries in place may be optimal from the networking point of view—as long as they are globally accessible. But how users "see" the database can be expected to vary only with their employer, clearance, and need to know.

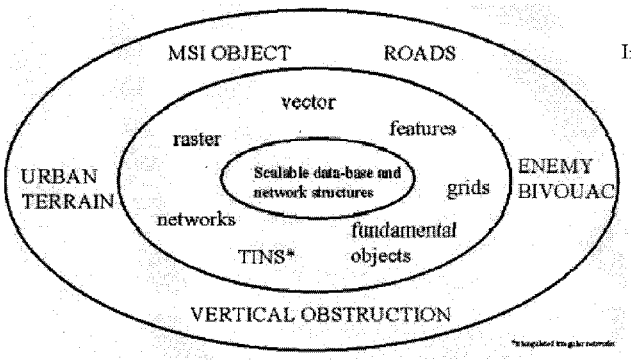
### 14.8 Annotation

The "NIMA database" must support value-added contributions from anyone, anywhere—the database must host user-supplied annotation. This opens it to a good deal of informed (but, alas, also uninformed) commentary but it also gives users a stake in understanding the GIS database because of their ability to contribute to it. (Although the emergence of client-to-client programs, such as Napster, suggest the distinction between clients and servers is eroding, all NIMA information should be server-accessible because client connections are uncertain and security implications of client-to-client connectivity have yet to be fully explored).

Over time, annotations should become a very significant part of the total database. Indeed, the value of having the database capture the feedback of users (both from DoD and the rest of the Intelligence Community) could rival that of the database itself. Annotation should be understood as exactly that: not the official database, itself, but commentary thereon. Thus, NIMA would retain responsibility for the master plot.

### 14.9 The Need for a Rigorous Data Model

In developing an architecture for the NIMA database a rigorous data model inherently comes first. All other decisions (such as the systems model) ought to follow, not lead. Such a data model can be conceptualized as the three concentric rings of the accompanying figure. In the center are the core scalable database and network structures (*i.e.*, the processing, storage, and distribution engines).




In the middle ring are the basic data types of a GIS: raster data, vector data, features data, networks, grids, TINs (triangulated irregular networks), fundamental objects etc. In the outer ring are constructed objects (*e.g.*, a street, a multi-spectral image, a vertical obstruction, an "urbanized area"). Such a data model, therefore, would contain a definition of feature classes, metadata, and symbology.

### 14.10 Ways to Absorb Data from Third Parties

Commercial GIS users are beginning to benefit from the widespread sharing of data sets. NIMA need not create all the information it provides. NIMA already has information-sharing agreements with many governments, and prospects for further sharing appear likely. Datasets can be acquired from other US departments and agencies, as well as from industry.

There are many data sets (*e.g.*, where embassies are located) that other entities (*e.g.*, the State Department) can affordably keep track of much more accurately than can NIMA, itself. There is no good reason for NIMA not to mirror such databases within its own system (mirroring eliminates the very significant problem of combining classified data with unclassified data and second, of thin or unreliable connections to third party servers).

Overall, the more NIMA's data model is compatible with counterpart data models used by the USGS, NOAA, FEMA, major allies, or key NGOs (*e.g.*, the World Bank)—the better. NIMA is best off adapting and adopting commercial standards that work. But where standards do not yet exist, NIMA has to step in to foster their creation to permit greater interoperability and collaboration. The VPF format used in VMAP was developed by NIMA; its success was verified when others (*e.g.*, NATO) adopted it. It helped that NIMA reached out to the

community in developing VPF and like activities in the future should have as much participation of the commercial world as they can get.

### 14.11 Methods to Deal with Logical Inconsistencies

At one level, logical consistency appears to be the *sine qua non* of a map. Roads are expected to connect, boundary lines to join at their edges, and most buildings sit over land not water.

Unfortunately, although reality may be consistent, databases often are not, especially when they come from different sources, or were made at different times. (both may have been right when made but may have been made at different times). The traditional approach—make it right—may not be the best. The desire to make things consistent inhibits incremental database updating in favor of explicit versioning. Flagging contradictions may be better than arbitrarily declaring one right and one wrong.

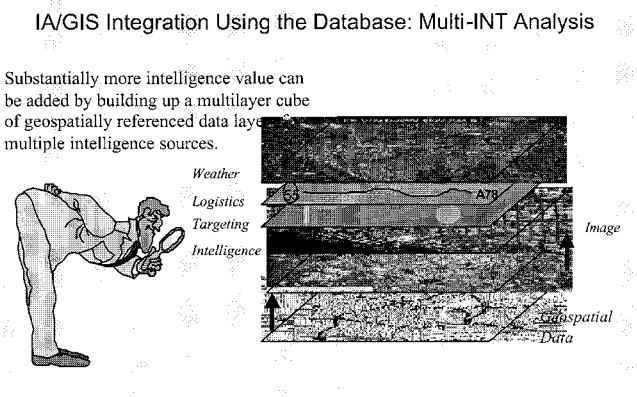
### 14.12 Methods to Separate Public from Restricted Information

NIMA's total information base can be divided into what is unrestricted and what is restricted---either by license and agreement or because of sources and methods. Currently almost all of NIMA's digital cartographic products are restricted for one or another reason. NIMA should continue to exert care in not confusing the protection of intellectual property with the protection of sources and methods so that legitimate government users need not have a security clearance merely to access "the database" for information that is not classified. The discerning reader will recognize the need for separation, yet integration of information as that old bugaboo of *multi-level security*. The Commission has no answer other than to suggest that *multiple levels of security* is a here and now solution. The paradigm shift that is hard for some to make is to do database operations at the lowest possible level (not "policy high") and then replicate the data to higher levels. To NIMA's credit, they seem to understand this. NIMA will also benefit from the DOD-wide rollout of a Public Key Infrastructure (PKI) and a concerted effort at Information Warfare Defense/Defensive Information Operations (IWD/DIO) designed to preserve the confidentiality, integrity, non-repudiateability and availability of essential information. And fortunately, although security is an area where the federal government often leads the private sector, commercial firms have increasing motivation to solve this problems of protection of intellectual property and privacy of proprietary data.

### 14.13 New Data Types

"The database" should be capable of holding new data types such as HSI, video, SAR-MTI and urban data. Each presents its own problems and taxes the extensibility of database design and the prescience of the data model. No simple answers are at hand except an open mind.

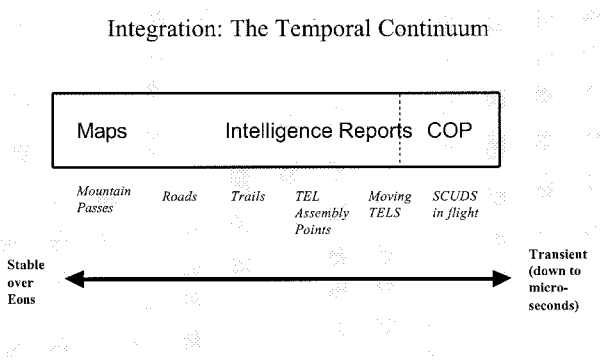
Powerful examples of the benefits of fusing multiple sources of intelligence are widely known, even if less-widely emulated. The challenge for NIMA is to ensure that its data model and database designs do not constrain the incorporation of new data types.




The logic of using geo-referencing to break the tyranny of the intelligence stovepipes is clear. Thus, the burden of multi-INT integration falls on NIMA—NIMA is clearly the enterprise to organize such an endeavor by virtue of its deep geospatial knowledge and its capacious storage and networking capability (even if, as argued further below, it needs more technological capability to assume the job.

### 14.14 Precision and Persistence

Resolution, or ground sample distance (GSD), are watchwords in the imagery world. Information differs in how accurately it can be measured. Imagery (both EO and synthetic aperture radar), for instance, can be accurate to the sub-meter level—but not always: *e.g.*, MSI, HSI, and USI, for technical reasons, have successively less resolution, and correspondingly less geospatial precision. ELINT data are even less precise; so is most acoustic and seismic information. Most weather data are measured over kilometers.




Information also differs to the extent that accurate measurement is meaningful. Some phenomena are inherently fuzzy. Neither the habitat of a species, nor the turf of a gang, the catchment area of a shopping center, or the track of a storm can be usefully measured in meters. Assigning geospatial attributions to other phenomena is a stretch. Rumors, for instance, about impending governmental decisions in Ethiopia may be geospatially tagged to a specific office building in downtown Addis Ababa, but such tagging feels artificial or at least of questionable value since its source and impact may be geospatially distant from the office. Some information has no real geospatial content whatsoever: the characteristics of a weapons system, or reports on an impending religious schism.

It is pointless to give geospatial information more precision than is warranted. But every datum has to be anchored to some location in a geospatial database.

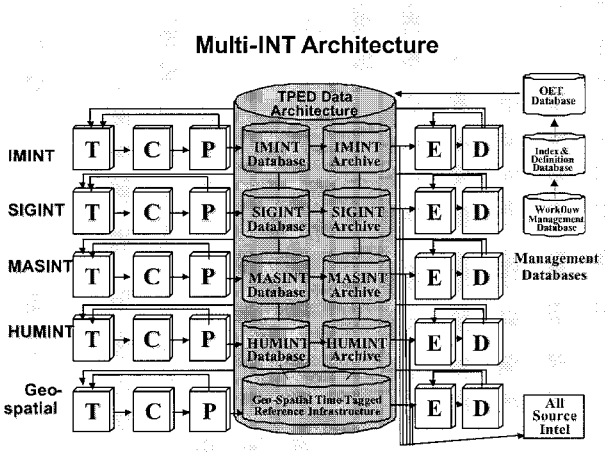
Persistence marks NIMA's products; evanescence marks the Common Operating Picture (COP). Yet, persistence is not a binary attribute. Take the accompanying figure. A mountain pass is forever. Successively, a paved road that traverses the pass, a gravel trail that leads off the road, an assembly point for mobile-missile launchers and finally, the Scud in flight are increasingly fleeting. Nevertheless, sensor-based data, for instance, of mobile objects acquires context, in large part, from a background of immobile objects. Accounting for trucks requires accounting for roads and passes, in a sense.

So where is the proper boundary between "NIMA's data" and that which makes up the Common Operating Picture (COP)? To what extent should NIMA's data model be built for eventual extension into the COP data model? Good questions, but no good answers, as yet.

### 14.15 Toward Multi-INT integration

The Commission believes that any architecture recommended by NIMA has to be able to evolve to a multi-INT architecture. Clear minds will separate this from the questions of who should implement and who should pay for the implementation.

NIMA should begin to engineer a broader architecture by which such INTs can be captured and presented in a coherent fashion. In its simplest form, other-INT data should be available as layers normalized to NIMA data. From whichever layer the user starts, he must be able to drill down to access the other information.




Multi-INT database(s), as they emerge, should take advantage of the inherent parallelism in TPED processes across the various INTs—as the accompanying figure

suggests, every INT, as a general proposition involves tasking, collection, processing, exploitation, and dissemination.

Still, it is important to note that the relationships among tasking, collection, and processing vary by INT. It is also important to note that this multi-INT architecture does not need to spring into being all at once. We can replace components as dollars and ideas permit, and invest in those areas that provide the highest payoff.

Serious thought is needed on how to manage a federation of databases, separately budgeted, with crosscutting management structures. Perhaps an intermediate but high-level interagency group could coordinate the overall data model, and the underlying technology standards, as well as sponsoring consulting and training. DIA's Joint Intelligence Virtual Architecture (JIVA) provides a model for consideration.

Finally—despite the Commission's enthusiasm—it is worth remembering that geo-referencing is not the only way to look at a mass of data.

### 14.16 Conclusions of the "Clean Sheet" Exercise

Building NIMA's architecture around a database that integrates maps and images and other relevant intelligence data, making this database independent of location and client, and permitting third-party annotation to it together constitutes the core recommendations for the information architecture.

Radical approaches like these are less risky than they sound. People have been doing data-centric architectures and databases for many decades, and GIS databases for at least two of them. The commercial industry is mature in all respects: workstations, databases, and GIS. Commercial capabilities already exist to do most of the imagery and geospatial manipulation that NIMA could want. NIMA is not being asked to approach this architectural requirement in a way and with a degree of effort that no one has ever done before; it is asked to apply familiar methods to its problems, which, if unique in scope, are not unique in form and content.

# 15. Recommendations

## 15.1 DOD and DCI Policy and Planning

### 15.1.1 Chairman, Joint Chiefs of Staff (C/JCS) should commission a study of the demands and constraints that military doctrine places on imagery intelligence and geospatial information. The study should be available for congressional review within 18 months.

With the increased reliance on Intelligence, Surveillance, and Reconnaissance (ISR) for military operations—witness the emphasis on information dominance canonized by *Joint Vision 2010/2020*—it is useful to reassess imagery and mapping support within the context of other military capabilities which it supports, and with which it competes for resources and management attention.

In some cases, the burden placed on NIMA, *inter alia*, for supporting evolving U.S. warfighting and peacekeeping doctrine is not fully appreciated. Moreover, the espoused doctrine of the individual services is not wholly synchronized with the *de facto* uses of imagery, and especially geospatial information, as they will manifest themselves over the next decade. The review of doctrine should aim to forecast better the future demands for these intelligence commodities, seek ways to better inform doctrine as to the likely availability and/or scarcity of new intelligence capabilities, and perhaps find ways to fine-tune doctrine so that it is less demanding of costly intelligence capabilities while achieving the same effect.

### 15.1.2 The Under Secretary for Acquisition, Technology, and Logistics (USD/AT&L) should include the cost of information as part of the total cost of ownership (TCO) of each new system; the programmed availability of that information should be the equivalent of a Key Performance Parameter (KPP). New, more emphatic guidelines should be promulgated to the Department of Defense, and available to Congress within one year.

Intelligence support, every bit as much as ammunition, fuel, spares, and training, is required to make today's military systems work. Too often in the past, a new weapons system was designed on the presumption that the information it needed to consume would appear, as if

by magic. Often, the Intelligence Community was able to work that magic. In today's fiscal reality, there is little or no discretionary resource left for such tricks. Such requirements, which can be forecast easily, must engender early debate about their dependence on an intelligence tail. Ignoring the intelligence bill—people as well as systems—at the outset precludes sound planning, programming, and budgeting, and forces invidious choices later on.

### 15.1.3 D/NIMA should provide positive mechanisms that inform every consumer as to the 'true cost' of NTM imagery in order to promote conservation of this scarce resource, as well as to support rational economic decisions about the use of commercial imagery.

Consumers—who levy requirements and generally make decisions that cause resources to be expended—must be turned into customers, with their appetites better matched to the nation's pocketbook, their expectations made more realistic. Among other things, this should help ensure that their decisions about use of commercial imagery are taken on an equal footing with those about use of national technical means. All-source analysts, weapons systems designers, operators—and, yes, even policymakers—all cause scarce intelligence resources to be expended on their behalf and should have a better appreciation of the opportunity cost of those resources at the time the effective decisions are made. The Community Management Staff, with C3I, shall perform the analysis as required to develop the cost basis, which will properly amortize all NTM development, acquisition, and operating costs.

## 15.2 Long-Term (Strategic) Versus Operational (Short-Term)–nee "National Tactical"

### 15.2.1 The DCI, operating through the ADCI/C in conjunction with the ADCI/AP, should provide a suitable mechanism for high-level, collaborative resolution of lingering imagery contentions.

The Commission found no conscious bias on the part of NIMA toward one community at the expense of another. Nevertheless, NIMA first of all needs to understand the ebb and flow of satisfying the competing demands and to sense when a serious imbalance looms; and

then needs to deal with changing perceptions of how it balances the needs of multiple customers across the national security community. NIMA must do a better job of establishing metrics and monitoring processes; the results of these should be made generally available. Notwithstanding, the perceived tension between the national community and the tactical community is a larger national security community problem, not the fault of NIMA, and the issue should be addressed as one of balancing long term (strategic) and operational (short-term) intelligence support to a wide range of customers.

The Commission believes that NIMA must be more attuned to impending imbalances; subsequently, communications between contending parties at a suitably high level can resolve disputes where positions among their respective subordinates have hardened. Even when the reconciliation disadvantages both parties, the example of high-level cooperation signals a spirit of cooperation that can keep an issue from festering among subordinates. The Commission was reminded repeatedly that the CINCs, too, have a national mission and they and their J2s do appreciate the necessity for investing intelligence in the long term even while subordinates closer to the daily fray sometimes do not feel they have that luxury.

## 15.3 Resources

### 15.3.1 ASD(C3I) and DDCI/CM should work with NIMA leadership to aggressively seek the sources and means—dollars, competent management, and skilled personnel—needed to make NIMA's mission whole and its infrastructure functional.

Admitting that resources are only part of the problem, the Commission observes that the Administration appears to have been reluctant to request from Congress those resources necessary to fully cure the ills that beset NIMA and to cover the acknowledged fiscal shortfalls. It is unclear why that might be, inasmuch as a failure to invest in imagery TPED will mean that the investment in FIA will not be fully realized. The fact that NIMA, as currently staffed, lacks the capability to execute those resources smartly does not mean the resources are not needed.

Budget forecasts have not been models of accuracy but rather the wishful consequence of an impoverished intelligence program, overall. The first step in repairing the problem is to

represent more accurately the true cost of TPED, the operations of NIMA as its mission has grown, and the cost to provide it with infrastructure that it failed to inherit from its predecessor organizations. A necessary concomitant is to establish metrics for determining that the money was well spent.

NIMA's analytic corps also requires relief from any future downsizing and in fact, a modest growth trajectory that will allow it to rebuild. As the corps gains back experience, the mentoring burden on those most experienced should lessen, which will, in turn, help erase the deficit of long-term research.

Finally, to anticipate a subsequent recommendation, centralized resources should be sought for offsetting the cost of commercial imagery.

### 15.3.2 The DCI and SECDEF should, at the earliest opportunity, provide additional SES/SIS billets for NIMA. Congress should act favorably on the request with similar alacrity.

NIMA requires an increasingly technical and skilled workforce and exceptional leaders to help it usher in the FIA area and fulfill the *Joint Vision* challenge of information superiority. NIMA is disadvantaged by the small number of SES/SIS billets it currently has—about half the overall government average, and many fewer, *per capita*, than other national intelligence agencies. The Commission considers it unlikely that it can find and retain the caliber of officer it needs and deserves unless the roster of SES/SIS positions can be augmented.

### 15.3.3 The Director of NIMA should request through the DCI, and Congress duly authorize and appropriate, an increment to the NIMA Program for advanced research and development (R&D); the position of Chief Technology Officer should be created and a top-notch individual found to encumber it.

The Commission is quite concerned about the level of research and development conducted by and on behalf of NIMA. Imagery and geospatial activities in the national security sector are only partially congruent with those of interest to the commercial information technology

sector. The Commission is convinced that inadequate R&D holds hostage the future success of TPED, USIGS, and of US information superiority.

NIMA's current budget for R&D is far from adequate, and the Director of NIMA is committed to trying to increase the NIMA R&D account. The Commission agrees that a larger percentage of the NIMA budget should be devoted to R&D, once the overall budget realistically is consonant with the mission—*i.e.*, *new* monies are required. To set a benchmark, the Commission notes that the NRO's Directorate of Advanced Science and Technology (AS&T) has a firm claim on 10-percent of the NRO's resources.

The notion of a Chief Technology Officer (CTO) who would be steward of the R&D program and technological confidant to the Director of NIMA appeals to the Commission.

## 15.4 Commercial Imagery

### 15.4.1 The Director of NIMA, in concert with the Director of NRO, should develop, within 120 days, a new commercial imagery strategy—i.e., prepare an integration plan for commercial imagery—consistent with current market conditions.

US policy, *a la* PDD-23, is to support US commercial space imaging ventures. Commercial imagery has obvious virtues: there are no security bars to sharing it with coalition partners, and/or Non-Governmental and Private Voluntary Organizations (NGOs and PVOs);[46] it can augment over-subscribed NTM assets and reduce contention for them; and ultimately use of commercial imagery can allow NTM to progress to esoteric sensing regimes of unique interest to the government.

Paradoxically, although US policy is to nurture US commercial space imaging, the existing NIMA/NRO Commercial Imagery Strategy has the characteristics of acting aggressively while in fact, performing poorly and passively with regard to commercial remote sensing products and services. While the leadership of those two organizations speak about a

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[46] Commercial imagery is, however, subject to terms and conditions of contracts designed to preserve the intellectual property rights of the "owner"—*i.e.*, it must be bought and paid for to include the population with whom it would be shared. This "surcharge" for sharing reflects, more or less, lost opportunity to the vendor.

commercial imagery strategy, what they have in effect is a vision which has insufficient detail and implementation guidance to be an effective plan. Moreover, not only does the NRO, through NIMA, market a product that is technically competitive in some applications with commercial imagery (the latter lacks timeliness and volume), they "give it away" to customers who have to bear the brunt of the cost for commercial imagery, but pay naught for NTM imagery.

The integration plan should encompass how requirements expressed by users get translated into and allocated to either NTM or commercial imagery. The FIA-MIND is supposed to handle commercial (and airborne) as well as NTM imagery, but this is presently more promise than fact. Moreover, the several Intelligence Community "requirements systems" now under development have not yet taken up this challenge.

The Commission has hope that the move it urges toward a "data-centric" architecture will provide new insights into how requirements for imagery, imagery-derived intelligence, and geospatial information can be treated more similarly than different, independent of whether the source is USG or commercial, national or theater, exoatmospheric or endoatmospheric.

Among the elements of a revitalized Commercial Imagery Strategy: the Commission would include the following:

- ✓ **Understanding NIMA's real role in the market**. The government's roles as a customer and regulator of a commercial market will depend on what fraction NIMA is of total market share.
- ✓ **Stable funding**: funding instability has dealt a serious blow to the strategy's implementation to date. Stability mechanisms might include "fencing" funds in the Office of the Secretary of Defense, as the Commission elsewhere recommends.
- ✓ **Improved coordination role:** NIMA needs to improve its users' understanding of the equities and costs involved in the use of commercial remote sensing, as well as offer other value-added services. Independent acquisition of commercial imagery by DoD and IC users should not be considered threatening to NIMA's purpose.
- ✓ **Focus on acquisition of products and services:** NIMA and industry need an open dialogue about the variety of products and services that might create new value,

whether for NIMA or intelligence, writ large. Imagery purchases are an important part, but not the whole of the strategy.

- ✓ **Hands off, mostly:** Any emerging industry spawns winners and losers. NIMA should engage all serious industry players, purposely avoiding overreliance on any supplier. NIMA should advertise demand, and attract its satisfaction in as competitive a manner as possible. Use of foreign providers should be considered case by case.
- ✓ **Refining its business model for commercial imagery**: NIMA needs a better acquisition model for commercial imagery products and services based on understanding which products and services contribute most to its mission.

The person chosen to develop the NIMA commercial imagery strategy–and thereby stand as the advocate for commercial imagery within the national security community– must have the authority and responsibility needed to perform these roles. He or she must work to develop an understanding of how commercial and national imagery information systems interact with each other. This person must hold senior status within NIMA for the program to be effective.

### 15.4.2 The Office of the Secretary of Defense should establish a fund against which defense elements wishing to make direct use of commercial imagery can charge their purchase.

Forcing individual components to trade off beans and boots and bullets for commercial imagery when NTM imagery is perceived as a free good is impractical and does not further the overall commercial imagery strategy embodied in PDD-23. While it may be expeditious for NIMA to administer the fund, the Commission feels it imprudent to establish the fund in the NIMA Program or, indeed, in any program outside the immediate purview of the Office of the Secretary of Defense.

This commercial imagery fund should be the vehicle for end-users to buy both raw imagery and vendor's value-added offerings. The Commission estimates that, for the first year, $350 million seems about right; based on what the Commission expects to be a positive experience, that number should be expected to rise substantially throughout the FYDP.

Note that this suggested amount for end-user purchases is exclusive of traditional outsourcing of NIMA legacy products, *e.g.*, maps.

While the Commission views the DOD as the largest and most immediate problem, the DCI would be expected to adopt the same strategy if the DOD experience lives up to expectations.

## 15.5 Outsourcing

### 15.5.1 D/NIMA should commission an independent 180-day study to determine the maximum extent to which outsourcing could be extended, to include operation of all infrastructure, production of all legacy MC&G products, and much science-based imagery analysis. Results of the study should be provided to the DCI and the SECDEF within 30 days of completion, together with D/NIMA implementation(s).

The Commission believes that NIMA should adopt a "disruptive" business model based on a commercial strategy that always looks first to commercial vendors for source data, value-added products, information services, and infrastructure support.

The Commission rationale is threefold: (i) outsourcing operation (and, in some case, *ownership*) of infrastructure frees up resources, but especially management attention and, in the case of IT, scarce skills; (ii) purchase of commodity items from vendors is nearly always preferable to internal USG production; and (iii) NIMA cannot, itself, afford to maintain a broad base of scientific skills.

The study should, *inter alia*:

- ✓ include a core business function analysis, and consideration of any wartime exigencies that might contraindicate outsourcing;
- ✓ distinguish between simply outsourcing USG operations and buying end products and services from commercial vendors;

- ✓ review the capacity of those vendors to respond to NIMA's needs and suggest steps that may be needed to incentivize commercial suppliers to make capital investments in order to meet those needs;
- ✓ aggressively solicit input from commercial interests to ferret out nontraditional ways in which the USG could better structure its activities to foster outsourcing;
- ✓ identify areas in which NIMA's embrace of open standards and/or industry standards *vice* government standards would enhance the opportunities for outsourcing; and
- ✓ identify internal organizational, contractual, and cultural barriers that stand in the way of taking maximum advantage of outsourcing opportunities.

In the event that independent study shows, as the Commission expects, that there are major untapped opportunities for relying on commercial vendors, NIMA should petition for relief as needed from procedures dictated by OMB circular A-76, which allows "internal" components to "compete" against external sources.

## 15.6 Commercial Technology

### 15.6.1 D/NIMA should periodically review all "NIMA Standards" which, if divergent from industry, should be revised (or revalidated); and, move NIMA toward a level 3 organizational rating[47] for Software and System Acquisition.

The Commission believes that NIMA should be an acquiring organization, not a developing organization. To that end, NIMA should look to commercial technology developers and producers for solutions. D/NIMA should periodically review all development activities and consider their transition to acquisition.

The Commission observed a key distinction between military and intelligence organizations in this regard: within the Department of Defense, the Services are responsible for acquisition, while the agencies and CINCs are responsible for execution. Intelligence

[47] Based on the Software Engineering Institute's Capability Maturity Model.

agencies like NIMA and NSA are responsible for both intelligence production and the acquisition of systems designed to provide that intelligence[48].

## 15.7 TPED

### 15.7.1 DCI and SECDEF, with the full support of Congress, should form an "Extraordinary Program Office" (EPO) within 120 days in order to ensure the prompt and efficient acquisition of required TPED functionality and equipment.

NIMA does not have the organic capability to successfully acquire TPED, nor can it "get there from here," in time, using normal government practice. There is no help on the horizon because neither the NRO nor NSA has talent to spare.

NIMA leadership should seek redress from federal hiring restrictions to identify incentives to attract experienced personnel to meet its needs. NIMA leadership should also work with the imagery and GIS industries and academia to determine how to improve the industrial base to encourage more growth in these fields.

For the EPO proper, the special authorities of the DCI should be extended to create the "spaces" and the DCI and SECDEF should intercede personally with the private sector to get the "faces" to fill those spaces. Congress should codify the exceptional measures needed to set up and operate this Extraordinary Program Office (EPO).

It is anticipated that the EPO shall have a five-year lease on life, after which the Director of the EPO and D/NIMA will have arranged for a smooth transition of the required capabilities into NIMA proper.

The Director of NIMA shall ensure that the EPO is not bogged down in bureaucracy; streamlined, responsive contracting, security, and infrastructure services should be available to the Director of the EPO; the NRO model suggests itself, here.

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[48] The NRO is unique in the IC in that it is basically an acquisition organization.

Elements of an EPO

- ✓ Armed with the special authorities of the DCI as required;
- ✓ Staffed with world-class talent recruited through the good offices and persons of the DCI and SECDEF for at least a 3-5 year period.
- ✓ Endowed with world-class System Engineering and Information Technology capability;
- ✓ Provided with a dedicated, effective procurement and contracts capability;
- ✓ Free of domination by the aerospace industry;
- ✓ Using the most effective government/commercial programmatic tools;
- ✓ Simultaneously building an in-house SE/IT capability in NIMA for the longer haul;
- ✓ Overseeing TPED and R&D as related but separate programs, *i.e.* strong R&D that is immune from depredations by short-term TPED development needs;
- ✓ Following a sound business plan as the basis for its activities;
- ✓ Pursuing an architecture in line with the Strategic/Organization/Management considerations;
- ✓ Giving priority to sorting out consistent approaches to IEC and OET/WPF;
- ✓ Ensuring that TPED architecture is not proprietary but is based on open systems.
- ✓ Alert to the implication of new technologies associated with new collection techniques.

Within 120 days of appointment, the Director of the EPO shall prepare and coordinate a set of definitions that define the scope and content of TPED, FIA, USIGS, and multi-INT TPED, and prepare and coordinate with users in the US Imagery and Geospatial Community (IGC) a TPED CONOPS.

Within the same time frame, the Director of the EPO shall re-baseline TPED requirements and lay out the broad architectural (re)design, developing a strategy for transition from

legacy and current acquisition to the desired end-state. As part of the re-baseline effort, significant FIA shortfalls as identified by the JCS shall be considered. The Director of the EPO, consistent with these definitions, shall prepare an acquisition strategy.

The Director of the EPO shall include in the acquisition strategy appropriate use of commercial hardware and software. "Appropriate use" includes a strategy to migrate from legacy GOTS and customized code to COTS products.

The Director of the EPO should make an early determination as to the advisability of adopting as a design philosophy the data-centric/Web-centric architecture expounded on by the Commission as a part of its "clean sheet" exercise, and periodically commission a "technology road map."

The Director of the EPO shall ensure that the TPED architecture either explicitly provides for inclusion of multi-INT or is demonstrably extensible to accommodate multi-INT.

### 15.7.2 D/NIMA should produce a proposed revision to the current plan for IEC acquisition and deployment, to include new cost and schedule data, for aggressively replacing all IDEX terminals with a fully capable commercial alternative; DDCI/CM and ASD(C3I) shall find the means to allow D/NIMA to execute this accelerated plan.

The Commission has found what appear to be viable commercial solutions for IDEX replacement built around the very latest generation of high-end PCs, video boards, and standard operating systems. These solutions are viable today because of the high velocity of technology and were not foreseen when the IEC plan was put in place. This emphasizes the need for more adaptable acquisition plans that provide for midstream technology insertion and the Commission anticipates that the requested revised plan will incorporate this philosophy.

Behind the enthusiasm of the Commission to drive the price continually lower for capable soft-copy imagery exploitation is the desire, finally, to drive a stake in the heart of film-based exploitation and the purchase of yet more light tables. Although this worthy goal was

embraced by FIA, whose baseline included no provision for the production of film, that has already been modified when it was realized that the lack of affordable soft-copy exploitation capability meant that it would not be sufficiently widespread in time.

### 15.7.3 The SECDEF shall direct the ASD(C3I) and Chairman, JCS, to support the Director of NIMA and the Director of NRO in the preparation of a plan which clearly indicates the role and integration of airborne and commercial imagery into TPED and which integrates geospatial and imagery analysis.

The ASD(C3I) shared with the Commission a TPED vision that stipulates several phases. A later phase, as he described it, calls for the integration of airborne and commercial imagery. The Commission endorses this phased approach, but believes that the time scale should be compressed and the phases given more definition at the earliest opportunity.

### 15.7.4 Director, NIMA, should get out in front of any potential FIA upgrade; in particular, he should study the implications for TPED for the five FIA shortfalls identified by the JCS, each of which could have major TPED implications and none of which has been considered fully in the current architecture.

These collection-system options would, if added to FIA, constitute major contingent liabilities in the TPED Program. The Commission is concerned that, yet again, the Community may decide to add collection capability with neither an end-to-end design, nor any thought to the resource implications for the TPED segment(s).

### 15.8 Imagery Dissemination

**15.8.1 ASD(C3I) should ensure that the communications architecture for imagery dissemination for Defense and its intersection with Intelligence subtends both the designs of NIMA (more generally, of the "national" systems) and the last tactical mile designed by the respective services and secure sufficient DOD funding for execution.**

ASD(C3I) must acknowledge responsibility for end-to-end architecture, and take more forceful cognizance of the discontinuities that exist.

**15.8.2 The ASD(C3I) shall coordinate the efforts of NIMA, DISA, and the NRO to ensure that both the communications links and acquisition strategy for communications systems are sufficient to support TPED in the FIA era. Director, DISA, shall certify his ability, within the current POM/IPOM, to satisfy NIMA communications needs for dissemination or report to the SECDEF and Congress on the reasons for his inability to do so.**

Current DOD policy requires that the Defense Information Services Agency be the communications provider of choice. Moreover, DISA, in its role as architect for the Global Information Grid (GIG) holds NIMA's life's blood in its hands. There is some reason to question whether two architects, NIMA and DISA, should work separately on two sides of the same architectural coin—storage (library design), and communications. Based on past performance, there is also some reason to question whether DISA can fully slake the thirst of NIMA's users for delivery of their images.

### 15.9 Multi-INT TPED

**15.9.1 The DDCI/CM and ASD(C3I) shall jointly determine the extent and pace of convergence toward a multi-INT TPED. Consistent with their findings, the Director of NSA and Director of NIMA, *inter alia*, shall conduct the necessary architecture study.**

This, too, is consonant with the vision of a phased TPED, which the shared with the Commission. In his plan, a move toward multi-INT TPED is the last stage, and the Commission agrees both with the ordering and with the recognition that such major changes

take time; however, we stand at an historic moment when both imagery and SIGINT are redoing their respective "TPEDs." Missing the opportunity for converging them would be regrettable.

## 15.10 Management—Director of NIMA

### 15.10.1 The Director of NIMA should establish a Technical Advisory Board

NIMA has a paucity of high-tech alumni. It did not inherit from its forebears—principally NPIC and DMA—a seasoned technical cadre or a tradition of technical excellence beyond the respective operational areas of imagery analysis and map making. Consequently, the Director should seek technical insight and inspiration, and some perspiration, from outside advisors.

The Director of NIMA can be well served by an external panel of experts who, jointly and severally, can bring broad experience of both government and the private sector. Diversity should be the hallmark of the Board, with individuals who are intimate not only with the traditional contractor base, but also information technology endeavors of emerging importance to NIMA—colloquially, "dot.coms" and the like—as well as the science base on which exploitation of some future collection systems will depend.

### 15.10.2 The Secretary of Defense, with DCI endorsement and congressional support, should fix the nominal tour length for the Director of NIMA at five years.

The current tour length of the Director of NIMA, 2-3 years, is too short to solidify accomplishments, institutionalize solutions, and sustain the momentum for needed change; it allows the Director's intent to be frustrated by recidivists who wait out the change in leadership.

The Commission recommends that the DCI and SECDEF, with such help from Congress as may be needed, ensure that the Director of the National Imagery and Mapping Agency (D/NIMA) serve a nominal term of not less than five years, absent cause for dismissal,

subject to the personal needs of the individual. In the event that an active duty military officer serves as Director, the cognizant military service must commit to this length of tour and Congress should ameliorate any unique hardship that this entails upon the military service. The available alternative is civilian leadership with a military officer as deputy. Whatever the solution, the objective is to ensure better continuity and sustain the momentum.

### 15.10.3 D/NIMA, along with other intelligence organizations, should work with the JCS to establish the need for, and CONOPS for, advising US commanders of the likely adversary insights into US operations—the OPFOR J2 role—given the loss of US imagery exclusivity.

Information superiority, in its fullest form, is not only about one's own state of knowledge, but also that of the adversary. As we lose sources and methods generally, and imagery exclusivity particularly, it is vital for US commanders to know what the adversary knows, or could know. NIMA, using commercial imagery and tools that could be available to the adversary in accordance with adversary intelligence doctrine, will have to impute what the OPFOR state of knowledge can be.

### 15.10.4 D/NIMA should consider appointing an "Archive Manager" to maximize the value of the imagery archive, to be the advocate for archive use, and to create a "spec-deck" for tasking "to inventory" otherwise unused imaging capacity.

NIMA has made the imagery library a centerpiece of its architecture—a data warehouse, from which users can pull imagery and which also infers users' needs and pushes imagery or imagery advisories to them. With the passage of time, some of the warehoused material will appreciate in utility such as historical coverage of a now-current crises area, while the utility of other material such as repeated coverage of an inactive target will decline. That is, the inventory in the warehouse has a current asset value and the goal is to maximize this value.

The "Archive Manager" would be responsible for managing the archive, estimating its current and future value, and actively trying to increase that value. Beyond improving procedures and heightening awareness, it is anticipated that the manager would have (low priority, "background") tasking/purchasing authority to add imagery and imagery products

to the library "on speculation." The metric by which the manager is rated is the "return on investment"—the increase in inventory value generated by the opportunity cost of the input.

The mission of the Archive Manager might be managing both the operation of the warehouse and its investment value.

## 15.11 Culture and Convergence

### 15.11.1 Director of NIMA should regularize and extrapolate to the organization more broadly his experiments with teams consisting of both Imagery and GIS analysts to work specific, high-priority issues.

The Commissioners were heartened by a planned "experiment" to integrate Latin America imagery and geospatial analysts, *i.e.*, collocate those analysts who are Latin American specialists. NIMA should set explicit goals and performance metrics to determine whether collocation and integration works, how well it works, and how it may be extrapolated to other parts of NIMA. The plan for further integration should address the goal of melding into an overarching NIMA culture the separate cultures now extant, and should include training as an integral part of the reformation.

# 16. APPENDIX A: Terms Of Reference For The Independent Commission National Imagery And Mapping Agency (NIMA)

## 16.1 OBJECTIVE:

To establish terms of reference (TOR) and an operating plan to ensure that the legislatively-mandated NIMA Commission complies with the Congressional language.

## 16.2 BACKGROUND:

The Appropriations Conference Committee Classified Annex to the FY 2000 Department of Defense Appropriations Bill requires the establishment of an independent Commission to review NIMA. The appropriations conferees agreed to the House-initiated language and included directive language in the FY 2000 Conference Report for the National Imagery and Mapping Agency Program (NIMAP/NFIP) and the Defense Imagery and Mapping Agency Program (DIMAP/JMIP).

## 16.3 GENERAL:

- The Secretary of Defense (SecDef) and the Director of Central Intelligence (DCI) will appoint the members of the Commission. The SecDef and the DCI have delegated these responsibilities to Assistant Secretary of Defense for Command, Control, Communications and Intelligence (ASD[C3I]) and Director of Central Intelligence for Community Management (DDCI/CM), respectively.

- The and DDCI/CM will select a Federally Funding Reserve and Development Contractor (FFRDC) to provide the Executive Secretary and Staff for the Commission.

- The DCI Administrative Staff will provide administrative, logistics, travel, security, and documents research support. The members of the Commission will be drawn from within and outside of the government.

- The commission shall include members with expertise in the following areas:

    - Large system development and acquisition;

    - Information technology;

    - Imagery technology;

- Telecommunications technology; and
- Organizational development

- The Commission shall include at least one member from the commercial imagery and geospatial industry and one member from an independent audit organization such as the General Accounting Office's Computer and Information Technology Assessment Office.

### 16.4 SPECIFIC COMMISSION TASKS:

- The Commission shall conduct a comprehensive review of NIMA's present organizational and management structures, current technology development and acquisition plans, business practices, and operational support services provided to the Defense Department and the Intelligence Community. The review should include, but not be limited to, the following issues and questions:
- The optimal future configuration of the management structure at NIMA;
- The most effective future course for NIMA's strategic technology development and acquisition programs;
- The prospect and the efficacy of greater use of commercial sources for imagery collection and exploitation, geospatial information, and storage and retrieval of data and information;
- The efficiency of NIMA business practices;
- An assessment of the NIMA workforce's acquisition experience and system integration experience, and
- The sufficiency of current requirements forecasts and cost estimates for USIGS to include an assessment of the adequacy of the budgetary resources devoted to USIGS over the current FYDP.
- The Commission will provide periodic briefings to the appropriations committees during the course of the Fiscal Year 2001 budget cycle with a final report to be delivered to the congressional defense and intelligence committee no later than 31 August 2000.

### 16.5 KEY EVENTS

The commission will execute a wide range of activities during its review of NIMA. Key events may include: agreement on Terms of Reference; information briefings by NIMA and other organizations as requested by Commission members; periodic updates to Congress;

site visits with national, theater and tactical customers; site visits to commercial vendors; site visits to NIMA operational locations.

## 16.6 ORGANIZATION/MANAGEMENT OF COMMISSION:

- Commission Members:
  - Peter Marino, **Chairman**
  - Kevin O'Connell, **Executive Secretary**
  - Nancy Bone
  - Jack Dangermond
  - Evan Hineman
  - Jim Hirsch
  - Robert King
  - C. Lawrence Meador
  - Keith Rhodes
  - Tom Weinstein
- Role of the Executive Secretariat

  The Executive Secretary will be responsible for developing the substantive themes for the Commission, record keeping, and the production of periodic briefings and the final report in accordance with commission direction. The Executive Secretary will ensure that all events required for the successful completion of review are accomplished by scheduling meetings with appropriate customers and adjacent agencies.

- NIMA's role:
  - NIMA will provide full access and availability to all data holdings and relevant documents as well as any further assistance as requested by the Chairman and the Commissioners.

# 17. APPENDIX B: List of Appearances and Interviews

The following is a list of individuals who appeared before the Commission or were interviewed by Commission Staff. Affiliations listed reflect the individual's primary association as of the time of the interview.

### 17.1 Office of the Director for Central Intelligence

CHARLES E. ALLEN
Assistant Director of Central Intelligence for Collection

BENNY L. BONK
Deputy Chief, Counter-terrorist Center

IRA CAMPBELL
Office of the Assistant Director of Central Intelligence for Collection

JENNIFER A. CARRANO
Director, Community Management Staff Requirements, Plans, and Policy Office

CHARLES G. CLAPP
Community Management Staff

ANITA I. COHEN
Community Management Staff

STEPHEN COMER
Office of the Assistant Director of Central Intelligence for Collection

JOAN A. DEMPSEY
Deputy Director of Central Intelligence for Community Management

MARY ENGEBRETH
Community Management Staff

GARY FOSTER
Director of Studies, Collection Concepts Development Center

AMBASSADOR LYNN HANSEN
Collection Concepts Development Center

JOHN C. GANNON
Assistant Director of Central Intelligence for Analysis and Production

LAWRENCE K. GERSHWIN
National Intelligence Officer for Science & Technology

NORMAN K. GREEN
National Intelligence Council

SHISHU S. GUPTA
Community Management Staff

PAUL INGHOLT
Community Management Staff

MG JOHN R. LANDRY
National Intelligence Officer for Conventional Military Issues

BRAD A.LUCAS
Office of Deputy Director of Central Intelligence for Community Management

JOANNE ROBBINS
Special Assistant to the National Intelligence Officer for Science & Technology

KEVIN SCHEID

### 17.2 Community Management Staff

JOSEPH J. LANDINO
Community Management Staff

A. NORMAN SCHINDLER
Nonproliferation Center

JAMES M. SIMON, Jr.
Assistant Director of Central Intelligence for Administration

JAMES E. STEINER
Chief, Crime and Narcotics Center

GEORGE TENET
Director of Central Intelligence

ROBERT D. VICKERS
National Intelligence Officer for Warning

GEARY YOUNCE
Community Management Staff

### 17.3 Central Intelligence Agency

CHRISTOPHER J. COFFIN
Collection Requirements and Evaluation

RAY CONVERSE
Issue Manager

SYLVIA L. COPELAND
Deputy Chief, Office of Transnational Issues

ROBERT B. FOUNTAIN
Chief, Intelligence Policy Branch Collection Requirements and Evaluation

DOLORES D. GREENE
Deputy Director of the Program Office for Community Analysis

ANNE C. GRUNER
Deputy Chief, Arms Control Intelligence

WILLIAM C. HATCHETT
Issue Manager

RICH HEGMANN
Issue Manager

S. LESLIE IRELAND
Issue Manager

TERRYL R. KRON
Intelligence Officer, Arms Control

SCOTT F. LARGE
Group Director

PAMELA MCMASTER
Issue Manager

JERRY POHL
DI/OTI

RUSSELL E. SCHWEIKHARD
Chief, Office of Transnational Issues Collection Team

ROBERT M. SCOTT
Deputy Chief, Collection Requirements and Evaluation

CAROLYN STETTNER
Chief, Collection Requirements and Evaluation

PATTY VOLZ
Collection Requirements and Evaluation
Chief, Current Operation Team

GERALD E. WALSH
Collection Requirements and Evaluation

SCOTT WHITE
Deputy Director of Transnational Issues

JEFFREY K. WICHMAN
Issue Manager

DENNIS WILDER
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JAMES CARR
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TERRENCE CASTO
Harris Corporation

GENE COLABATISTTO
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SPOT Image Corporation

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Vexcel Imaging Corporation

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**The Commission also received written comments from:**

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BRAN FERREN
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Applied Minds, Inc.

# 18. Glossary of Terms

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| ACTD | Advanced Concept Technology Demonstration: a defense program whose projects are developed to engineer emerging technologies and move them to the field. |
| AOR | Area of responsibility: the responsibility of a regional CINC. |
| API | Application portability interface: a piece of software, usually embedded in an operating system, which translates software code into a request for service. |
| Application | The use of capabilities (services and facilities) provided by an information system specific to the satisfaction of a set of user requirements. [P1003.0/D15] |
| Application Platform | The collection of hardware and software components that provide the services used by support and mission-specific software applications. |
| Application Portability Profile (APP) | The structure that integrates federal, national, international, and other specifications to provide the functionality necessary to accommodate the broad range of federal information technology requirements. [APP] |
| Application Program Interface (API) | (1) The interface, or set of functions, between the application software and the application platform. [APP] (2) The means by which an application designer enters and retrieves information. |
| Architectural Structure | Provides the conceptual foundation of the basic architectural design concepts, the layers of the technical architecture, the services provided at each layer, the relationships between the layers, and the rules for how the layers are interconnected. |
| Architecture | Architecture has various meanings depending upon its contextual usage. (1) The structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time. [IEEE STD 610.12] (2) Organizational structure of a system or component.[IEEE STD 610.12]<br><br>The Department of Defense, in its own wisdom, defines three levels |

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| | of architecture, *Operational Architecture, Technical Architecture,* and *Systems Architecture.* |
| Architecture Target | Depicts the configuration of the target open information system. [DoD 8020.1-M] |
| Architecture, Database | The logical view of the data models, data standards, and data structure. It includes a definition of the physical databases for the information system, their performance requirements, and their geographical distribution. [DoD 8020.1-M, Appendix J] |
| Architecture, Infrastructure | Identifies the top-level design of communications, processing, and operating system software. It describes the performance characteristics needed to meet database and application requirements. It provides a geographic distribution of components to locations. The service provider for these capabilities defines the infrastructure architecture. It includes processors, operating systems, service software, and standards profiles that include network diagrams showing communication links with bandwidth, processor locations, and capacities to include hardware builds versus schedule and costs. [DoD 8020.1-M, Appendix J, specifically paragraph 5(14)(c), Table J-2] |
| Architecture: Baseline and Target | Defined and are significant parts of the technical management planning information (previously the technical management plan [TMP]). [DoD 8020.1-M with Change 1] |
| Automated Information System (AIS) | Computer hardware, computer software, telecommunications, information technology, personnel, and other resources that collect, record, process, store, communicate, retrieve, and display information. An AIS can include computer software only, computer hardware only, or a combination of the above. [DoDD 8000.1] |
| Availability | The probability that system functional capabilities are ready for use by a user at any time, where all time is considered, including operations, repair, administration, and logistic time. Availability is further defined by system category for both routine and priority operations. [JOPES ROC] |
| Baseline | A specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further |

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| | development and that can be changed only through formal change control procedures or a type of procedure such as configuration management. [IEEE STD 610.12] |
| $C^4ISR$ | Command, control, communications, computers, intelligence, surveillance, and reconnaissance: DoD's operational information systems considered together. |
| CAD | Computer-aided design. |
| CAT | Computer-aided topography: a medical imaging technique. |
| CIA | Central Intelligence Agency: the lead agency of the intelligence community responsible for analysis and HUMINT. |
| CIB | Controlled image base: NIMA's consolidated imagery of the world accurate to five meters. |
| CINC | Commander in Chief: a US general (or admiral) responsible for military operations over a specified area of operations. |
| CMO | Central MASINT Office: a DoD agency dealing with MASINT. |
| Communications Link | The cables, wires, or paths that the electrical, optical, or radio wave signals traverse. [TA] |
| Communications Network | A set of products, concepts, and services that enable the connection of computer systems for the purpose of transmitting data and other forms (*e.g.*, voice and video) between the systems. |
| Communications Node | A node that is either internal to the communications network (*e.g.*, routers, bridges, or repeaters) or located between the end device and the communications network to operate as a gateway. [TA] |
| Communications Services | A service of the Support Application entity of the Technical Reference Model (TRM) that provides the capability to compose, edit, send, receive, forward, and manage electronic and voice messages and real-time information exchange services in support of interpersonal conferencing. [TA] |
| Communications System | A set of assets (transmission media, switching nodes, interfaces, and control devices) that will establish linkage between users and devices. |
| Configuration Management | A discipline applying technical and administrative direction and surveillance to (a) identify and document the functional and physical |

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| | characteristics of a configuration item, (b) control changes to those characteristics and (c) record and report changes to processing and implementation status. [MIL-STD 973] |
| Connectivity Service | A service area of the External Environment entity of the Technical Reference Model that provides end-to-end connectivity for communications through three transport levels (global, regional, and local). It provides general and applications-specific services to platform end devices. [TA] |
| COP | Common Operational Picture: a software application that shows where military units are stationed or military activity is taking place |
| pCOTS | Commercial-Off-the-Shelf (COTS)–Refers to an item of hardware or software produced by a commercial enterprise, available for general purchase, and sold in the marketplace to a variety of customers. Such items are at the unit level or higher. Such items must have been sold and delivered to government or commercial customers must have passed customer's acceptance testing, be operating under customer's control, and within the user environment. Further, such items must have meaningful reliability, maintainability, and logistics historical data. COTS has also been defined as "products that ship in volume." |
| DARPA | Defense Advanced Research Projects Agency: a two billion dollar defense agency in charge of high-risk R&D. |
| Data Dictionary | A specialized type of database containing metadata, which is managed by a data dictionary system; a repository of information describing the characteristics of data used to design, monitor, document, protect, and control data in information systems and databases; an application of data dictionary systems. [DoDD 8320.1] |
| Data Element | A basic unit of information having a meaning and that may have subcategories (data items) of distinct units and values. [DoDD 8320.1] |
| Data Interchange Service | A service of the Platform entity of the Technical Reference Model that provides specialized support for the interchange of data between applications on the same or different platforms. [TA] |
| Data Management Service | A service of the Platform entity of the Technical Reference Model |

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| | that provides support for the management, storage, access, and manipulation of data in a database. [TA] |
| Database Utility Service | A Service of the Support Application Entity of the Technical Reference Model that provides the capability to retrieve, organize, and manipulate data extracted from a database. [TA] |
| DIA | Defense Intelligence Agency: a defense agency in charge of assessing foreign militaries. |
| Directory Service | A service of the External Environment entity of the Technical Reference Model that provides locator services that are restricted to finding the location of a service, location of data, or translation of a common name into a network specific address. It is analogous to telephone books and supports distributed directory implementations. [TA] |
| Distributed Database | (1) A database that is not stored in a central location but is dispersed over a network of interconnected computers. (2) A database under the overall control of a central database management system but whose storage devices are not all attached to the same processor. (3) A database that is physically located in two or more distinct locations. [FIPS PUB 11-3] |
| EIS | Enhanced Imagery System: a future but interim constellation of imaging satellites expected to precede FIA. |
| Enterprise | The highest level in an organization—includes all missions and functions. [TA] |
| Enterprise Model | A high level model of an organization's mission, function, and information architecture. The model consists of a function model and a data model. |
| EO | electro-optical: a family of imaging sensors that collect imagery in or just beyond the visible spectrum. |
| EPO | Extraordinary Program Office: a procurement office that enjoys great flexibility in manpower, budgeting, and reporting practices. |
| External Environment Interface (EEI) | The interface that supports information transfer between the application platform and the external environment. [APP] |
| FEMA | Federal Emergency Management Agency: a US agency responsible for disaster relief. |

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| FFD | Feature Foundation Data: NIMA's 1:250000 series base maps |
| FIA | Future Imagery Architecture: the next complete constellation of imaging satellites distinguished by their greater numbers and larger pictures. |
| Function | Appropriate or assigned duties, responsibilities, missions, tasks, powers, or duties of an individual, office, or organization. A functional area is generally the responsibility of a PSA (*e.g.*, personnel) and can be composed of one or more functional activities (*e.g.*, recruiting), each of which consists of one or more functional processes (*e.g.*, interviews). [Joint Pub 1-02, DoDD 8000.1, and DoD 8020-1M] |
| Functional Activity Program Manager (FAPM) | FAPMs are designated by PSAs and are accountable for executing the functional management process. Supported by functional representatives from the DoD Components, FAPMs develop functional architectures and strategic plans, and establish the process, data, and information system baselines to support functional activities within the functional area. [DoD 8020.1-M Ch 1 B(2)] |
| Functional Architecture | The framework for developing applications and defining their interrelationships in support of an organization's information architecture. It identifies the major functions or processes an organization performs and their operational interrelationships. [DoD 5000.11-M] |
| Functional Area | A range of subject matter grouped under a single heading because of its similarity in use or genesis. [DoDD 8320.1] |
| Functional Data Administrator (FDA) | Office of the Secretary of Defense (OSD) PSAs exercise or designate functional data administrators to perform data administrator responsibilities to support execution of the functional management process, and to function within the scope of their overall assigned responsibilities. [DoDD 8320.1 and DoD 8020.1-M, Appendix A] |
| Functional Economic Analysis (FEA) | A structured proposal that serves as the principal part of a decision package for enterprise (individual, office, organization -see function) leadership. It includes an analysis of functional process needs or problems; proposed solutions, assumptions, and constraints; |

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| | alternatives; life-cycle costs; benefits and/or cost analysis; and investment risk analysis. It is consistent with, and amplifies, existing DoD economic analysis policy. [DoDI 7041.3, DoDD 8000.1, and DoD 8020.1-M, Appendix H] |
| GA | Geospatial analyst: a professional capable of extracting meaning from geospatial data. |
| GIG | Global Information Grid: a DoD concept under which its information systems would be bound in a common network and have access to common information services. |
| GIS | Geospatial information system: a complete information system, which primarily holds cartographic, imagery, and related intelligence data. |
| GPS | Global Positioning System: a satellite constellation that permits receivers to locate themselves accurately to within a few meters |
| Hardware | (1) Physical equipment, as opposed to programs, procedures, rules, and associated documentation. (2) Contrast with software. [FIPS PUB 11-3] |
| HSI | Hyperspectral imaging: an imaging system that slices the visible (and nearby) spectrum into very small slices to bring out differences in reflectivity otherwise too subtle to see in a normal image. |
| HUMINT | Human intelligence (*e.g.*, informants, attaches, spies). |
| IA | Image analyst: a professional capable of extracting information from images using photo interpretation and other skills. |
| IMINT | Image intelligence. |
| Information | Any communication or representation of knowledge such as facts, data, or opinions, in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual forms. [OMB CIRC A-130] |
| Information Domain | A set of commonly and unambiguously labeled information objects with a common security policy that defines the protections to be afforded the objects by authorized users and information management systems. [DISSP] |
| Information Management (IM) | The creation, use, sharing, and disposition of information as a resource critical to the effective and efficient operation of functional activities. The structuring of functional processes to produce and |

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| | control the use of data and information within functional activities, information systems, and computing and communications infrastructures. [DoDD 8000.1] |
| Information Resources Management (IRM) | The planning, budgeting, organizing, directing, training, promoting, controlling, and management activities associated with the burden (cost), collection, creation, use, and dissemination of information by Agencies and includes the management of information and related resources, such as Federal information processing (FIP) resources. [PL No 99-591, DoDD 8000.1.] |
| Information Technology (IT) | The technology included in hardware and software used for Government information, regardless of the technology involved, whether computers, communications, micro graphics, or others. [OMB Circular A-130 and DoDD 8000.1.] |
| Infrastructure | Infrastructure is used with different contextual meanings. Infrastructure most generally relates to and has a hardware orientation but note that it is frequently more comprehensive and includes software and communications. Collectively, the structure must meet the performance requirements of and capacity for data and application requirements. Again note that just citing standards for designing an architecture or infrastructure does not include functional and mission area requirements for performance. Performance requirement metrics must be an inherent part of an overall infrastructure to provide performance interoperability and compatibility. It identifies the top-level design of communications, processing, and operating system software. It describes the performance characteristics needed to meet database and application requirements. It provides a geographic distribution of components to locations. The service provider for these capabilities defines the infrastructure architecture. It includes processors, operating systems, service software, and standards profiles that include network diagrams showing communication links with bandwidth, processor locations, and capacities to include hardware builds versus schedule and costs. [DoD 8020.1-M] |
| INT | Intelligence: all forms of information collected on an adversary or other operationally relevant target. |
| Integration | Integration is the result of an effort that joins two or more similar |

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| | products such as individual system elements, components, modules, processes, databases, or other entities, and produces a new product that functions, as a replacement for the two or more similar but less capable entities (products), in a framework or architecture in a seamless manner. Institute of Electrical and Electronic Engineers (IEEE) Standard (STD) 610.12 defines an "integration architecture" as a framework for combining software components, hardware components, or both into an overall system. [IEEE STD 610.12] |
| Interoperability | (1) The ability of two or more systems or components to exchange and use information. [IEEE STD 610.12]. (2) The ability of the systems, units, or forces to provide and receive services from other systems, units, or forces, and to use the services so interchanged to enable them to operate effectively together. The conditions achieved among communications-electronics systems or items of communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users. [Joint Pub 1-02, DoD/NATO] [JOPES ROC] |
| IR | Infrared |
| Legacy Environments | Legacy environments could be called legacy architectures or infrastructures and as a minimum consist of a hardware platform and an operating system. Legacy environments are identified for phase-out, upgrade, or replacement. All data and applications software that operate in a legacy environment must be categorized for phase-out, upgrade, or replacement. |
| Legacy Systems | Systems that are candidates for phase-out, upgrade, or replacement. Generally legacy systems are in this category because they do not comply with data standards or other standards. Legacy system workloads must be converted, transitioned, or phased out (eliminated). Such systems may or may not operate in a legacy environment. |
| Life Cycle | The period of time that begins when a system is conceived and ends when the system is no longer available for use. [IEEE STD 610.12] AIS life cycle is defined within the context of life-cycle management in various DoD publications. It generally refers to the usable system life. |

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| Local Area Network (LAN) | A data network, located on a user's premises, within a limited geographic region. Communication within a local area network is not subject to external regulation; however, communication across the network boundary may be subject to some form of regulation. [FIPS PUB 11-3] |
| MASINT | Measurement and signatures intelligence: a catchall term for all sensor information that does not resolve itself into a recognizable image. |
| Migration Systems | An existing or a planned and approved AIS officially designated to support common processes for a functional activity applicable to use DoD-wide or DoD Component-wide. Systems in this category, though fully deployed and operational, have been determined to accommodate a continuing and foreseeable future requirement and have been identified for transitioning to a new environment or infrastructure. A migration system may need to transition to the standard technical environment and standard data definitions being established through the Defense IM Program, and must "migrate" toward that standard. In that process it must become compliant with the Reference Model and the Standards Profile. A system in this category may require detailed analysis that involves a total redesign, reprogramming, testing, and implementation because of a new environment and how the "users" have changed their work methods and processes. A detailed analysis may identify the difference between the "as is" and the "to be" system. [DoD 8020.1-M.] |
| MRI | Magnetic resonance imaging: a medical imaging technique. |
| MSI | Multi-spectral imaging: the color information in an EO image. |
| Multimedia Service | A service of the TRM that provides the capability to manipulate and manage information products consisting of text, graphics, images, video, and audio. [TA] |
| NIMA | National Imagery and Mapping Agency: a combat support and intelligence agency responsible for cartography as well as geospatial and image analysis. |
| NOAA | National Oceanographic and Atmospheric Administration: a civilian agency tasked with weather forecasting and conducting or supporting research on the air and oceans. |

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| NRO | National Reconnaissance Office: a DoD agency responsible for designing and engineering reconnaissance and surveillance satellites. |
| NSA | National Security Agency: a DoD agency responsible for collecting signals intelligence. |
| NTM | Literally, "National technical means," a euphemism coined for treaty negotiations to avoid mentioning, *inter alia*, imagery reconnaissance satellites. It is often used, now, to distinguish imagery satellites flown by the USG from commercial imagery satellites. |
| OGC | Open GIS Consortium: a six hundred member consortium that develops and fosters geospatial information standards. |
| Open Specifications | Public specifications that are maintained by an open, public consensus process to accommodate new technologies over time and that are consistent with international standards. [P1003.0/D15] |
| Open System | A system that implements sufficient open specifications for interfaces, services, and supporting formats to enable properly engineered applications software: (a) to be ported with minimal changes across a wide range of systems, (b) to interoperate with other applications on local and remote systems, and (c) to interact with users in a style that facilitates user portability. [P1003.0/D15] |
| Open Systems Environment (OSE) | The comprehensive set of interfaces, services, and supporting formats, plus user aspects for interoperability or for portability of applications, data, or people, as specified by information technology standards and profiles. [P1003.0/D15] |
| Operating System Service | A core service of the Platform entity of the Technical Reference Model that is needed to operate and administer the application platform and provide an interface between the application software and the platform (*e.g.*, file management, input/output, print spoolers). [TA] |
| Operational Architecture | The *Operational Architecture* embodies the concept of operations (CONOPS). It identifies the operational relationships and information needs. |
| Platform | The entity of the Technical Reference Model that provides common processing and communication services that are provided by a combination of hardware and software and are required by users, |

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| | mission area applications, and support applications. [TA] |
| Portability | (1) The ease with which a system or component can be transferred from one hardware or software environment to another. [IEEE STD 610.12] (2) A quality metric that can be used to measure the relative effort to transport the software for use in another environment or to convert software for use in another operating environment, hardware configuration, or software system environment. [IEEE TUTOR] (3) The ease with which a system, component, data, or user can be transferred from one hardware or software environment to another. [TA] |
| Process Model | Provides a framework for identifying, defining, and organizing the functional strategies, functional rules, and processes needed to manage and support the way an organization does or wants to do business—provides a graphical and textual framework for organizing the data and processes into manageable groups to facilitate their shared use and control throughout the organization. [DoD 5000.11-M] |
| Profile | A set of one or more base standards, and, where applicable, the identification of those classes, subsets, options, and parameters of those base standards, necessary for accomplishing a particular function. [P1003.0/D15] |
| Profiling | Selecting standards for a particular application. [P1003.0/D15] |
| Response Time | The ability to react to requests within established time criteria. To be operationally effective, the system must product the desired output in a timely manner based on system category for routine or priority operations. [JOPES ROC] |
| RFC | Request for comment: an Internet standard. |
| Scalability | The ability to use the same application software on many different classes of hardware/software platforms from personal computers to super computers (extends the portability concept). [USAICII] The capability to grow to accommodate increased work loads. |
| Seamless Interface | Ability of facilities to call one another or exchange data with one another in a direct manner. Integration of the user interface that allows a user to access one facility through another without any noticeable change in user interface conventions. [DSAC SYS IM] |

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| SIPRNet | Secure Internet Protocol Router Network: DoD's Internet system for classified content. |
| SOAP | Simple Object Access Protocol: a proposed standard by which serialized XML-tagged material can be ingested into external programs. |
| SQL | Structured Query Language: a standard language used to formulate queries posed to databases. |
| SRTM | Shuttle Radar Topography Mission: a recent shuttle mission (November 1999), which measured global elevations to high levels of precision. |
| Stovepipe System | A system, often dedicated or proprietary, that operates independently of other systems. The stovepipe system often has unique, non-standard characteristics. |
| System | People, machines, and methods organized to accomplish a set of specific functions. [FIPS PUB 11-3] |
| System Management Service | A service of the Platform entity of the TRM that provides for the administration of the overall information system. These services include the management of information, processors, networks, configurations, accounting, and performance. [TA] |
| Systems Architecture | The *Systems Architecture* relates capabilities and characteristics to operational needs. |
| TCP/IP | Transmission Control Protocol/Internet Protocol: the key transport and addressing protocol for the Internet. |
| Technical Architecture | The *Technical Architecture* specifies a set of performance-based, primarily commercial, information process, transfer, content, format, and security standards. These standards specify the logical interfaces in command, control, and intelligence systems and the communications and computers (C4I) that directly support them. The technical architecture is a practical document, that identifies standards where products are available today. It is entirely consistent with and supportive of DoD's Specification and Standards Reform. |
| Technical Reference Model (TRM) | The document that identifies a target framework and profile of standards for the DoD computing and communications infrastructure. [TRM] |

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| TEL | Truck, erector, and launcher: a vehicle from which missiles such as SCUDs are launched. |
| TIN | Triangulated irregular networks: a way to approximate an irregular surface by elevation points that are clustered in areas with inflection points or rough surfaces. |
| TPED | Tasking, processing, exploitation, and dissemination: a series of steps that, collectively, constitute NIMA's role in the process of imagery analysis (collection is outside NIMA's charter). TPED is made up of the functional allocation of ground segment tasks to support (imagery) collection/acquisition whether *via* satellite, aircraft, or commercial purchase. |
| UAV | Unmanned aerial vehicle: an airplane-like air breathing vehicle that is remotely flown and, to date, mostly used for taking pictures or video. |
| User | (1) Any person, organization, or functional unit that uses the services of an information processing system. (2) In a conceptual schema language, any person or any thing that may issue or receive commands and messages to or from the information system. [FIPS PUB 11-3] |
| User Interface Service | A service of the Platform entity of the Technical Reference Model that supports direct human-machine interaction by controlling the environment in which users interact with applications. [TA] |
| USGS | US Geological Service: the US agency responsible for land cartography and conducting or supporting research on the US landmass. |
| USI | Ultraspectral imagery: a more concentrated form of HIS. |
| USIGS | US Imagery and Geospatial Service: a NIMA umbrella term for its overall information system. |
| VMAP | Vector Map: a designation for a certain class of NIMA maps. VMAP.0 is a globally complete series of 1:1000000 maps. |
| VPF | Vector Product Format: the format by which the digital information of VMAP is encoded. |
| VPN | Virtual Private Network. |
| WAP | Wireless access protocol: a proposed standard by which Web pages can be received by and displayed upon small screen devices such as cell |

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| | phones. |
| WGS | World Geodetic System: the standard by which points on earth are measured in real space (the current standard is WGS-84). |
| XQL | XML (extensible hypertext markup language) query language: a proposed language by which queries can be made against material marked up by the tags specified in the XML standard. |



[Whereupon, at 4:25 p.m., the subcommittee adjourned.]

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