

*INCIDENTAL PAPER*

## **Seminar on Intelligence, Command, and Control**

**The National Imagery and Mapping Agency  
Roberta E. Lenczowski**

### **Guest Presentations, Spring 2002**

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# ***Program on Information Resources Policy***



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## The National Imagery and Mapping Agency

Roberta E. Lenczowski

March 14, 2002

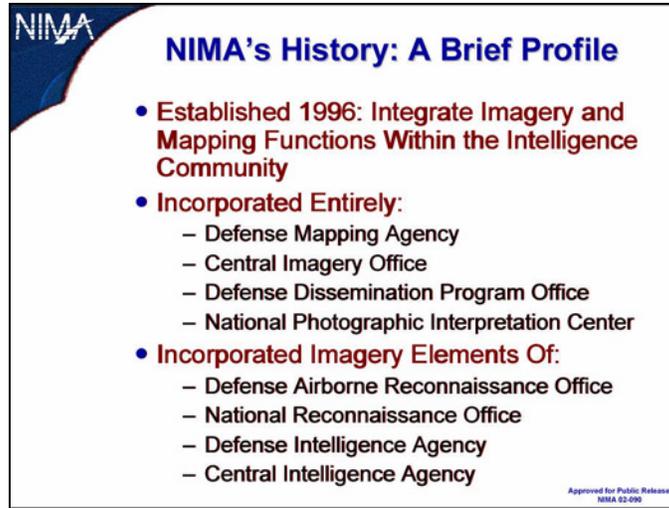
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*Roberta E. Lenczowski is technical executive, National Imagery and Mapping Agency (NIMA). She began her professional career with the Defense Mapping Agency (DMA) in 1977, and after serving in several technical positions was promoted to a supervisory position in 1984. In 1986 she was made a supervisor in the digital products department. In 1988, when the DMA realigned its technical support into a Systems Center, Ms. Lenczowski was named manager of a staff-level office for the Systems Development Group. In 1988 she was named chief of the Aerospace Center department that produced the DMA's standard digital products, and in February 1989 she became chief of the data services department. She was reassigned to the Systems Center in July 1991, reporting to the Washington headquarters facility as chief of the warrior support division. From August 1992 until July 1995, she served as technical advisor for geographic information systems for the DMA and was then selected as DMA's director of acquisition and technology. She was assigned to the NIMA implementation team in December 1995, and when NIMA was activated in 1996 assumed the position of associate deputy director of operations. A year later she became the deputy director for operations, until she was selected for her current position in September 2001. Ms. Lenczowski holds a classical B.A. degree in philosophy from Creighton University, an M.A. in philosophy from St. Louis University, and an M.S. in geodetic science from Washington University.*

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**Oettinger:** It gives me great pleasure to welcome our speaker today, Bobbi Lenczowski. We are especially grateful to her for coming here on such short notice, when General Clapper couldn't make it. I just want to add that she is a powerhouse in her own right. You've had a chance to read her biography, so I won't take up more time with an introduction.

**Lenczowski:** NIMA is the newest agency in the intelligence community, and we are also a combat support agency (**Figure 1**). We report to both the director of central intelligence and the secretary of defense. As you can see from the chart, when we stood up in October of 1996 we merged both complete organizations as well as elements of other organizations. The DMA brought us the majority of the employees and the geospatial or mapping mission. The imagery intelligence mission is supported by the imagery analysts who came from the National Photographic Interpretation Center [NPIC] and one of the divisions of the Defense Intelligence Agency [DIA].



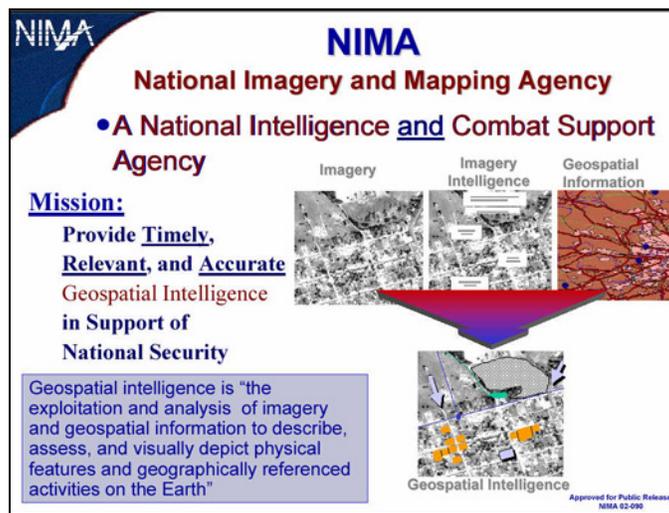
**NIMA's History: A Brief Profile**

- **Established 1996: Integrate Imagery and Mapping Functions Within the Intelligence Community**
- **Incorporated Entirely:**
  - Defense Mapping Agency
  - Central Imagery Office
  - Defense Dissemination Program Office
  - National Photographic Interpretation Center
- **Incorporated Imagery Elements Of:**
  - Defense Airborne Reconnaissance Office
  - National Reconnaissance Office
  - Defense Intelligence Agency
  - Central Intelligence Agency

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Figure 1

With the advent of General Clapper as the new director of NIMA in September 2001, we made revisions to our mission statement (**Figure 2**). We had previously identified our mission as providing timely, relevant, and accurate imagery, imagery intelligence, and geospatial information; we now describe our mission as providing timely, relevant and accurate geospatial intelligence. NIMA fuses the imagery provided by national and commercial collectors with the imagery intelligence and geospatial information produced by NIMA analysts to deliver geospatial intelligence. That output is provided to our military customers as well as to the all-source analysts at the CIA [Central Intelligence Agency] and DIA and to other national decisionmakers.



**NIMA**  
**National Imagery and Mapping Agency**

- **A National Intelligence and Combat Support Agency**

**Mission:**  
**Provide Timely, Relevant, and Accurate Geospatial Intelligence in Support of National Security**

Geospatial intelligence is "the exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth"

Imagery      Imagery Intelligence      Geospatial Information

Geospatial Intelligence

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Figure 2

**Oettinger:** Is that different from imagery or imagery intelligence?

**Lenczowski:** The information—whether reports, digital products, precise points, or datasets—is not “different from” but, rather, the synergistic result of imagery as a source, with imagery analysts and geospatial experts completing the exploitation of that imagery. During the first year of NIMA’s existence, when Leo Hazlewood was the deputy director for operations, he authorized a series of pilot projects to allow us to demonstrate the promise of this synergy, and to emphasize the response to the question of “Why NIMA?” Since that time, we have built beyond those simple projects into organizational change that aligns our production and analysis employees, not into discipline stovepipes, but collaboratively against functional issues and regions of the world. Those regions of the world tend to align quite compatibly with the unified and specified commands.

**Student:** Given the three elements of your mission, how do you, or would you, bring together all those processes and different products? Are you doing some kind of “three-way build” of the databases?

**Lenczowski:** Each of the legacy functions—imagery, imagery intelligence, and geospatial information—had its own databasing conventions, tools, and archives. In the future, we would expect a data architecture to which we would post our data and from which our customers would just draw directly. Today, they still have to go into the various databases, but we are building the geospatial databases that people will populate with geospatial intelligence. To some extent, today some of that comes together in a database sustained by the DIA called the MIDB—the military intelligence database. When NIMA’s accurate geopositioning is incorporated, you get some really good, precise geospatial positioning. That accurate information is more and more being incorporated with the rest of the intelligence data.

**Oettinger:** There is a nascent academic and professional discipline of geospatial information systems. It is so rudimentary that there may be one or two universities in the United States practicing it. Here at Harvard there is an informal association of folks who are thinking about it, but the notion that you have some Web capability where you give some coordinates and can pull out this and that is an idea whose time has come. The realization isn’t quite here yet.

**Lenczowski:** Yet there are lots of people who have similar desktop capabilities. There was a particular version of Microsoft Office (not the current one) that had a linkage from an Excel spreadsheet with ZIP codes to a mapping tool called MapInfo, and it could give you a graphic representation of where those ZIP codes were on a U.S. map. It ought to be that easily available. If you go to MapQuest or MapsOnUs and you want to figure out where something is—you have an address, or you have a name—you get onto the Web and you use those particular tools, and what comes up in response is geospatial information. That is in fact being generated by some of these geographic information systems [GIS] that were referred to.

**Student:** Can you describe the demographics of the people who do this work? Is there concern because so many of the government people were retiring ten or so years ago? Do you expect to contract out some of this, or how do you expect to be able to maintain and train your talent pool?

**Lenczowski:** This is one of the reasons I wanted questions and answers as we went along. We have very much the same problem with respect to the demographics of our work force. It’s

particularly noticeable on the geospatial side of the house, where the vast majority of our work force is over age forty. In fact, we have taken a look at the people who are eligible for either retirement or early retirement between now and 2010. We did some of this, because we were looking at our outsourcing opportunities. Most of the geospatial population would be entirely depleted by 2010, because, like most federal agencies, we went through a period when there was no additional funding coming in and, in addition, our workforce was being downsized. There was no or minimal hiring. We are missing a generation.

On the imagery analysis side of the house, we have a slightly different situation. Various factors contribute to that. When we stood up, we had an authorized level of imagery analysts that we could have coming from the NPIC and the DIA. In fact, we did not fill all those positions. Just as we stood up, the CIA offered an early out to employees, so we lost a certain number of imagery analysts who chose to retire. Then there were some who said, "Wait a second. I don't think I want to go to this new agency. I can become an all-source analyst," and they went. We had lots of vacancies, and we put in place a very aggressive recruiting and hiring program, so that today we are actually pretty healthy with respect to our original number of imagery analysts.

Almost 60 percent of our imagery analysts have fewer than five years of experience. That's a good news-bad news story. The good news is that we've filled those particular ranks. The bad news is that there is always concern in any of the intelligence disciplines when our experience base is not deep. But I have to tell you that there is a certain amount of energy and new skilling that comes with these new entrants into our work force, and it is exciting to see the great work that they are doing. The difficulty is, though, that there is still a gap between the new hires and the group of people who are our mentors and are getting closer and closer to their own retirement.

**Oettinger:** In a cynical sort of mode, there's a saying that where there's death there's hope. The older generation was often very good at stopping Soviet missiles and spotting weapons of mass destruction plants and things.

**Student:** I presume the principal feeder for your aggressive campaign was the military services.

**Lencowski:** That was a good source for filling some of our deployed positions. We have 114 analysts who sit in the joint and unified service centers. But most of these new hires, who sit predominantly in the Washington area, are young college graduates. It really and truly is energizing to be with them and watch what they are doing. We've got excellent mentoring from senior analysts. That's what gives us the bridge. It gives us the competence and assurance. As I said, there's a balance here between the good news piece and the bad news piece.

We have also been authorized, as we move up into the POM [program objective memorandum] years (starting next year), to expand our imagery analysis. We have an additional authorization of several hundred billets, so that's good news. That part of the business will, in fact, begin to grow.

**Student:** Is that a function of the president's recent plus-up of \$40 billion over the FYDP [future years defense plan]?

**Lenczowski:** Yes, it's part of that. But most of it is also the result of the focus on and intention of strengthening the intelligence community.

What is geospatial intelligence (**Figure 3**)? We kind of talked about this, but, by definition, it's about objects that you're going to locate here on the earth and then talk about the "what" and "where." "Where am I?" is positional accuracy.



**Figure 3**

There's another thing that we do when we talk about the broad range of our responsibilities, and that is answer questions about "How do I get to where I need to go safely?" As an agency, we are responsible for the safety of navigation. Most people do not realize that we broadcast safety-of-navigation information for the maritime community from our Bethesda facility twenty-four hours a day. We do that not just for the Department of the Navy. All maritime users have access to that broadcast.

**Student:** Is that NOAA [National Oceanic and Atmospheric Administration]- related and weather-related as well?

**Lenczowski:** We do not do weather predictions or reports per se. We do the piece about hazards, which may be weather related.

Clearly, from the intelligence standpoint our focus is not just on inanimate things that are on the surface of the earth, which was the main responsibility of the geospatial DMA activity. The graphic illustrates that we're also worried about where the friendlies and the enemies are and what the environment is like, so we are incorporating both fairly static information about the stable things and very dynamic observations influenced by human activity and intent.

General Clapper had an interesting insight this past summer when he was getting oriented to the agency, before he actually moved in as the director. He sat with us one day, and he said, "The way I see this is that you have an incredible kind of tension within the organization, which is not bad, but it is tension. From the geospatial side of the house, you have inherited a group of people

who know about precise measurement and exact positioning. They live in a world of metrics. Everything has its appropriate location. You have brought together that kind of an approach with an intelligence community that deals with a great deal more ambiguity. We talk about ‘possible’ and ‘probable.’ Those two terms are characteristic of imagery analysis reporting. ‘It’s probable that this is what’s happening,’ or ‘It’s possible that this is what’s happening,’ on the basis of what we can observe. So you move all the way from things that are pretty static—measuring things on the earth—to things that are pretty dynamic.”

**Student:** It seems to me you could have “when” on the slide also.

**Lenczowski:** Yes. The important piece is that as we continue to move ahead with the issues of how we build the databases, we believe that time-tagging everything that goes into the databases is essential. “When” is specifically an appropriate element or parameter of intelligence.

Imagery analysts maintain what we call “shoeboxes.” Nearly all of ours are still in the hard copy environment. Those shoeboxes are their historic collections of annotated imagery about their topics of interest over time. These experts are incredibly proficient in retrieving information they need.

**Oettinger:** The best wizardry of technology has not yet managed to approximate the good shoebox.

**Lenczowski:** That’s right, and that is one of the challenges we have as we move to an all-soft-copy environment. How are we going to capture the processes and the techniques that are associated with the shoebox? We need the ability to reach into a box, pull up twenty images, and go through them quickly and say, “This is the one I want.” We have yet to find a computer environment that can bring up that much information as rapidly.

**Student:** Even if you did, you’d probably have a tough time getting people to give up their shoeboxes.

**Lenczowski:** Yes, that would be one of our big challenges.

**Student:** You said earlier that one of the missions of geospatial intelligence is to be more predictive and actionable. Are you finding that to be true as you mature as an agency? Are the combatant commanders acting more on your information than they did previously?

**Lenczowski:** The best way to answer that is to give you an example. Certainly some of you in the room are very familiar with the Kosovo action in 1999. One of the very first products that we got out received a lot of public attention, but it may not have been known that we helped put together all the background. The product made it possible to associate the fires, the burnings, that were taking place with the ethnic displacements in Kosovo. That was a case where we integrated the work of the different parts of our organization into a tool that was at that point only in beta development by the ESRI Corporation. It actually had come from a tool called Oilstock that the NSA [National Security Agency] had developed, which tracked things. Working with ESRI through a contractor called TASC, the NSA had taken that government tool and turned it into something commercial that is now called Tracking Analyst. We used that and were able to

provide the commanders the geographic and intelligence information that they needed and that they could use in an unclassified environment. *USA Today* carried a picture of the map background with the fires and the ethnic displacement.

That was a really good example of being able to do something that would never have happened had we been the independent agencies I identified in the first slide. We would never have had the opportunity for one part of the organization to say, “We’re trying to deal with this” and have a discussion take place in another part of the agency that said, “Wait a second! I can help you with that.” So, in a weekend’s time, we pulled all that together. That’s one example, and there are several comparable examples of things we are doing right now to support the Afghanistan activity.

**Oettinger:** What you say at the bottom of the slide [Fig. 3] is a remarkable achievement, but it doesn’t go all the way in terms of what one would want to know. It’s a capability, and even the evolution from the known—the very certain geographic location of something—to “probably/possibly it’s a missile or it’s a mine or whatever” is impressive. When we go over to intent there’s relative silence. So the intelligence job is not all done by geospatial information systems.

**Lenczowski:** Not at all. Much of this gets fed into the all-source environment, where an all-source analyst who is drawing upon a variety of pieces is able to put together things that give more certainty.

**Oettinger:** It’s certainly fundamental that in spite of “globaloney” and so on, things happen at specific locations, and if you don’t have this kind of locale information you’re flying blind.

**Lenczowski:** Our vision used to be “Guaranteeing the Information Edge.” That was really appropriate as we were moving into more and more of an information environment and had new information management techniques. Again, as part of our work in transforming NIMA, which is the way General Clapper likes to refer to what’s been going on, in addition to changing the mission statement we discussed earlier we changed the vision (**Figure 4**). It started out as just “Know the Earth.” We said, “Well, that’s fine and good, but geographers know the earth. We’re not geographers. That’s not the issue.” When we added “Show the Way,” we picked up the visionary piece. It’s not simply about populating databases with information about the earth. It is, in fact, about allowing us to give information to those who either make decisions, or plan, or integrate additional pieces of information and fuse things together to help show the way. We provide information in many forms: controlled image bases, digital terrain elevation data, safety of navigation (air/sea), standard map products, intelligence products, foundation feature data, three- and four-dimensional models and fly-throughs, digital point positioning databases, and targeting information.

The intent is that we will provide our customers with access to our databases. This is an incredibly tough problem, and we take criticism all the time about how unavailable our information can seem to be. We’ve had a gateway for a long time, but being able to go into the gateway and get information delivered in any kind of timely fashion is problematic, because geospatial datasets, particularly when they are what we call rasters—where you take an image and create a digital version of it—are very large. They take a long time to go over the communication lines, so someone who’s sitting out there gets very impatient.



Figure 4

We did a study on the use of the information that we have in our gateway, and did some metric graphs, because we keep track of all the hits and computer downloads. It doesn't come as a real surprise, but it's confirming to see graphically how fast the use drops off. The larger the dataset, the fewer downloads there are. We really wanted to see where the knee in that curve was, because that was critical. Once you get over twenty megabytes, requests for electronic transmission drop way off. Ten- or twenty-megabyte files are okay; people are downloading those. CD-ROM distribution is the preferred distribution method for the larger files.

As an example, we do some really great fly-throughs. They are very interesting, and they're wonderful for allowing planners to visualize. They're great for allowing pilots the opportunity to go through and effectively fly the route, or for infantry to walk the route, or for ships to navigate the route, but they are incredible bandwidth hogs. So, even though we've got some of those fly-throughs out there, the number of hits on them is very small. One of the criticisms of some work we did in preparation for part of the Afghanistan action was that it took longer to download the file than it did to do the fly-through. Once you get the file into your environment, of course, your own processors take over, and you can do the fly-through very effectively.

**Oettinger:** That's part of the answer to the question about why imagery doesn't get down to the deployed levels. It's not simply a plot on the part of the upper echelons to hide information from you; it's bandwidth-limited.

**Student:** Is there any active program to try to mirror some of these datasets in the places where the customers are?

**Lencowski:** We talked about that at lunch, in terms of one of the pieces that we have in place, because the question had to do with taking more advantage of the GBS [Global Broadcasting System]. I'm going to jump right out of the arguments that are going on in the community about the allocation of bandwidth from GBS. As you know, it's dynamic, and it's prioritized, and there is real concern that once everybody learns about GBS there will be such a demand that it won't be

able to satisfy their requests. One of the things that we would like to do to take advantage of the GBS is get things to the East Coast. We can transmit from St. Louis to the East Coast; then we can get into GBS lines directly and send data to servers in Bahrain. That would be the intent for the current operation: get it forward-deployed to Bahrain, and then make the customer responsible for getting it distributed that “last tactical mile” (which is longer than a mile). That will help. Then we need to have some kind of routine activity in place to ensure that updated information gets into that system.

**Oettinger:** That illustrates shifting balances and readjustments. After the occupation of the U.S. embassy in Teheran, it became highly desirable to have data centralized so it wouldn't be sitting someplace near the battle lines where it could be captured. Now we're happy to repopulate databases in Bahrain. The first time Al Qaeda grabs one of those, we will revisit how to keep them in St. Louis and try to build pipes that will make it only instantaneously and evanescently available in Bahrain and points farther into central Asia. I keep harping on balancing acts, and it's not an unmitigated blessing to forward position everything.

**Lenczowski:** One of the strategies we have used in the last several operations has been something that we call our quick-response servers. We preload those and distribute them with all the information that we have on the area of interest. But there's no updating strategy in place for those, whereas this other approach builds one in.

You're right. Everything has its tradeoffs, so you would have to analyze where the risks are, and what risks you believe you can manage or tolerate, and find some manageable way to deal with them.

**Student:** I also think that if you look at the power projection and the DOD [Department of Defense] philosophy of moving to a smaller footprint forward, such as our relative withdrawal from Europe (down to 100,000), you then have the requirement that technology move forward when, in actuality, force structure is moving back. That seems kind of counterintuitive. You probably need a quick means to ratchet up the bandwidth to move forward with these larger files, but I can't see much forward deployment beyond Bahrain; maybe at JAC [Joint Analysis Center] Molesworth.

**Lenczowski:** Other discussions take place about how you do theater downlinks. There has been analysis of that kind of concept that brings up all those discussions of “Is it worth the investment, because it's a very costly kind of endeavor, and what are you trying to achieve when you do it? When do you need direct downlink?”

**Student:** You talked about the multiple hits or greater proportion of downloads of files that are twenty megabytes or less. As you start moving that way under the NIMA construct, could not that standard geographic set be a means to maintain it, consistent with the combatant commander's area of responsibility? Is that a reasonable option?

**Lenczowski:** Yes. That's why we started to pay attention to statistics that we've been collecting for some time. We needed to know what really is the activity on the line, and why it takes place. It isn't just because of the value of the datasets. That's certainly one of the aspects of it, but the

other is the size. We're distributing some of the datasets, but we're simply using hard media to do it.

This last sentence [Fig. 4] is really important as we move to understanding the future in terms of being able to provide timely, tailored data. The traditional geospatial model, which is the one that most people are familiar with, is a standard map. The standard map-production strategy is one that reflects the cold war. We built lots and lots of maps to take us to Moscow, and we built them so we would never have to use them. That was the philosophy. We didn't want to use them, but we made sure they were on the shelves, because the fact that we had them was a deterrent in itself. It was a good strategy for the cold war, but it is not the appropriate strategy for dealing with a need for more and more tailored information. The only way we can tailor it quickly is if we have a good data architecture and good, solid information management tools in place that allow us to do that. We cannot do that with a fairly inflexible paper environment.

**Oettinger:** The counterintelligence folks have to be satisfied that when they make their queries it's you and not some impostor who reports to Osama bin Laden.

**Lenczowski:** Now there's a whole piece about information assurance and a term that General Clapper has coined, "geospatial assurance," which is a dimension beyond just information assurance. We have a responsibility to make sure of the accuracy and the integrity of the contents.

**Student:** To whom do you delegate decisions about when information becomes stale?

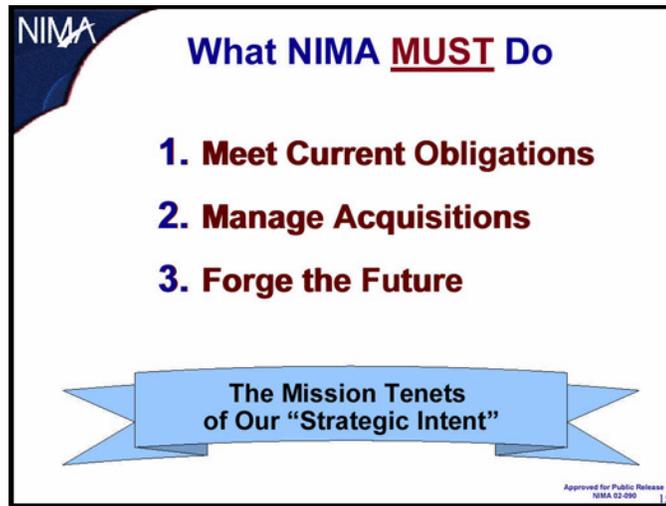
**Lenczowski:** In the old mapping paradigm, obsolescence was identified for each of the product suites. A map had a certain viable lifetime, and after that we moved it into a category called "limited utility," until it got to the point where it reached obsolescence: "It's ten years old and has to be recompiled." We never created the same kind of model with respect to digital data, even though we've been producing some digital products on the geospatial side since the early 1970s.

On the intelligence side, that information is so dynamic and so volatile by its very nature that it really has to do with having analysts whose responsibility it is to keep up with their particular region or their particular issue on a daily basis. As they review the imagery source, they put entries into the database that say, "No change," or they note what the change is. They have a persistent database responsibility.

**Student:** The requirements for a database responsibility are not directly related to all-source analysis. Is there a middleman in terms of data collection?

**Lenczowski:** In terms of collecting imagery, yes. There is a whole requirements process that determines how frequently we collect imagery over a particular issue or area. That model is reviewed on at least an annual basis. We have increased the timeliness of review of what we call the standing deck. That used to be something we did sequentially. We did one area of the world, and then we moved to another area. We've reorganized in terms of our tasking and collection efforts so that we're regionally aligned. Every region has an annual review of its own outstanding jobs, to ensure that those requirements and the periodicity of the collection reflect the interest or the priority issues.

This is how we have focused ourselves (**Figure 5**). We have a strategic intent that has ten tenets. These are the top three, and the reason I point these out is that this also happens to be our organizational model. Remember I told you that the old organizational model, from an operational standpoint, was three stovepipes [Fig. 2]. In addition to that, we had people who were worried about the acquisition effort, and then we had all the other cats and dogs of keeping an organization functioning, like financial management and human resources and security.



**Figure 5**

The new organization model within NIMA says that we meet current obligations—that’s the “now” part of the organization (**Figure 6**). That is the production of imagery intelligence and the geospatial information for geospatial intelligence. Managing the acquisition is the “next” part of the organization, and that’s concerned with acquiring the systems we will use next. For us, that’s something that had formerly been referred to as the U.S. Imagery and Geospatial Information System. That has been changed in title, but not in intent. It is now the National System for Geospatial Intelligence.

Forging the future is the “after-next” part. Let me tell you about the after-next, because it isn’t merely looking at things temporally. It’s not assuming that the people assigned to this activity are only worrying about what happens after 2006 or 2007. This is as much about conceptual change as it is about time. It is about introducing changes in processes, procedures, techniques, and tactics into the “now” activity—some wonderful technology or new practice that should be inserted right now, because the bang is absolutely outstanding. In some cases that means introducing it into the acquisition cycle and so picking up on that cycle and ensuring that this newest thing gets incorporated into the recapitalization effort that takes place. We always have to look at the future as not necessarily being exclusively on a temporal dimension. It’s as much about new ideas being incorporated.

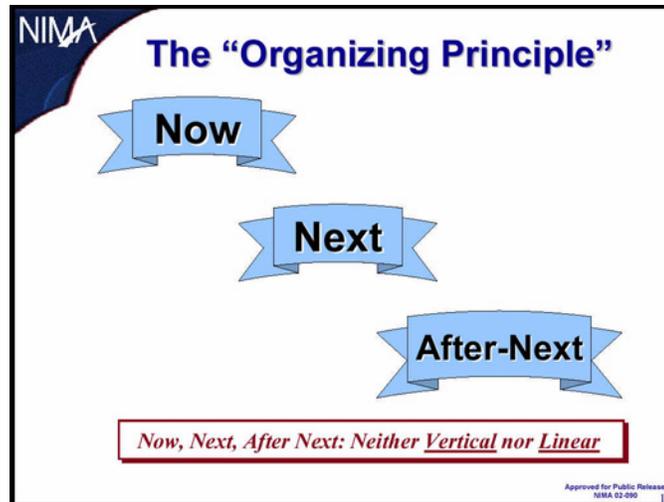


Figure 6

You know how real estate people say, “It’s location, location, location.” That again underscores the piece about geospatial intelligence. Everything and everybody must be some place. It’s our job to make that “some place,” in terms of understanding it, as accurate as we can. It falls into a concept in *Joint Vision 2010* and *2020* called information superiority or decision superiority. If you have read those documents, you’ve seen the caveat in them that this is not about perfect knowledge. This is about ensuring that you reduce and quantify or characterize the ambiguity in the situation for the decisionmakers within their decisionmaking time frame. I always say, “Actually, you have to do it within the decisionmaking time frame of the opponent.” You’ve got to be better than the time frame of the opponent.

The key components of information superiority include information transport—command, control, communications, and computers. Then there are information operations, information warfare, and information assurance, and a common operating picture, which provides dominant battlespace awareness, situation awareness, and information visualization. Here’s where we drop down to our responsibility. At the base of what we need for data fusion, we have the solid foundation about the “somewhere,” the “some place,” that is our geospatial framework. Into that we fuse the information you get from the imagery, the picture, and the imagery intelligence piece. Then you add other things that are not NIMA’s responsibility—all-source intelligence and information on coalition forces, logistics, and weather—but those are all essential in terms of information superiority, to ensure that the kinds of things that fit under “common operating picture” happen.

We’re in the business of information visualization, and the people whom we hire like to live, deal, and work within a visual environment. They work with portrayals. But I would be misleading you if you walked away today believing that was the end state, that it’s only about visualization. Visualization is incredibly important to us as human beings, but those new GIS tools that are emerging also put powerful analytic capability into the hands of people who understand how to use them. For instance, you can query databases that have been populated properly with GIS tools to ask, “Where can I find a fairly flat location to quarter my troops that is within three miles of a readily accessible hard-paved road, within a couple of miles of a water

supply, and so far away from a major populated area that they wouldn't be detected?" Those are the kinds of queries that you can put into tools that are about ever so much more than just visualization. Of course, the end product that the system provides may be a visual representation of the answer to a particular question.

When we say "geospatial foundation," it helps if you understand what we have told our customer community about what constitutes it. What they should be able to get from us starts out with what we call a controlled image. What we mean by that is that we have imagery, whether it came from a national collector or a commercial collector—and that commercial collector can be aerial, or a satellite—and we have positioned it so that you have some sense that it is, in fact, controlled to the earth. There is some geopositioning associated with that image.

We have also told our customers that we're going to give them a standard digital product that we call digital terrain elevation data at level 2. That means that we provide a grid with an elevation identified for what we call "posts" every thirty meters across the surface of the earth. Level 1 is every 100 meters. The levels just have to do with the density of the data. We can give this information to our customers at a high level of integrity and fidelity. We also include in our foundation data the hydrographic information for safety of navigation and the aeronautical information for safety of flight. Those are other pieces of our suite of responsibility.

We tell our customer community, "We'll give you this thing we call foundation feature data, which includes the population, transportation network, contour lines, surface drainage, vegetation, boundaries, and information on data quality. It is not as robust as all the information you would find on a standard map sheet, but it is sufficient for you to initiate your final process, because if you have a controlled image, the elevation data, and whatever you need for safety of navigation, we can take this feature information and we can portray it symbolically on top of that image. So we'll give you a minimum set of information, but you'll have the image that sits under it, and if you take that image and you drape it over the model with all these grids, you can do perspective scenes, you can do fly-throughs, you can do walk-throughs, and if you're the Navy and you're coming up on shore with Marines, you can do swim-throughs, if that's what you need to do. That's our readiness posture. We'll also be responsive, because we know that your particular operation has some very specific needs."

The mission-specific datasets, which could be DTOP [digital topographic data] at levels 1–5, urban data, or information for special operations, have timelines associated with them, so if the controlled imagery, digital terrain elevation data, hydrographic information, and aeronautical information are ready in the database, we can rapidly populate the other information that needs to go into the database when the operation starts. We can bring it up to date, we can augment it, we can make the data points more dense, and we can make it more accurate, if that's what's required, within particular time limits. That's the model that we laid out.

**Student:** Within the geospatial framework, is there any room for derivative products that NIMA provides?

**Lenczowski:** Controlled imagery all by itself is a product. If you only wanted the controlled image base from us, we would provide that. That is frequently what people ask for in connection with an operation, because it's the first really quick good look at where you're going. The

elevation data are also a product. Hydrographic and aeronautical information are products all by themselves. Those are constantly available. The foundation feature data could be a products by itself if somebody just wanted that information.

For people who still live in a graphical, paper environment we can print something that looks an awful lot like a map sheet. It has the same kinds of coordinate systems on it, it has the same kinds of marginalia, and it has the same kind of symbology, so they can use it in that paper environment. It is an interim, substitute product that can be provided quickly.

**Student:** Of those product sets, which ones are government owned, and which are commercial? Where does the overlay, or synthesis of the two domains, occur?

**Lenczowski:** All the ones I mentioned are government. We have contractors who do production for us in all these arenas. The interesting piece of this is that many of those products are what we call “limited distribution.” They are unclassified (all the products I mentioned are unclassified), but they may be limited distribution, which means we can share them with coalition partners, but because we do coproduction with international partners, not all our information is available to third parties. We enter into agreements, so we have to have release approval, if you will, from a coproducing partner with respect to the data.

This gets to a rather interesting challenge, certainly in the case of hydrographic products. In many countries the geospatial information, like the hydro product, is a revenue source. If we just gave the information away free to users other than the DOD or coalition forces, we would, in fact, create problems with their revenue source.

**Student:** What sorts of feedback loops do you have with your customers, especially on some of the new products? A commander may not know a certain type of product is available. How do the customers know what to ask for?

**Lenczowski:** That’s a good point, and that has to do with part of the overall training program for which we have a responsibility. We have a college, called the NIMA College, that has a responsibility to help train our customers. We actually have mobile teams for the military that we send out periodically throughout the commands, so that we can keep deployed people up to date on the products and their utility and use. One of the greatest products with respect to our baseline data actually requires a rather sophisticated user, so we do special training and certification. But, as you all know, in the military there’s rotation of positions, so you may get some people who become experts in using that particular product, and then they’re rotated out and a new batch comes in. So we have a persistent training program through the college. On our Web site we keep information about what we have, what the explanation of that product is, and what its intended use is, so if you have Web access to the gateway you have a mechanism to get that. We also distribute printed documentation.

**Student:** Is that what drives your R&D [research and development] as you go on?

**Lenczowski:** R&D is driven by a variety of mechanisms. With respect to providing support to the military, the interaction is with the individual services at the service level. We have NIMA support teams whose responsibility is to keep in lockstep with the services to ensure we

understand what the emerging weaponry and systems are, so that if new product suites or product sets are required we can get busy developing them. The teams also help to make sure that the services don't make bad decisions as they develop new products or systems, because they didn't know what we were going to do. The combination of controlled imagery, digital terrain elevation data, hydrographic and aeronautical information, and foundation feature data is not terribly new conceptually but fairly new in the sense of being embedded in the concept of operations for the future of the military services. This is the result of work we've done cooperatively with the user community through two efforts over the past six years by the geospatial information integrated product teams. It's working its way into the doctrine of the services now.

**Student:** Do you update all these products annually?

**Lenczowski:** Paper products are updated on the basis of their established "obsolescence rates." Those are established in the requirements documentation. Hydrographic and aeronautical information have cycles. Aeronautical information is updated every twenty-eight days or a multiple of twenty-eight days. The hydrographic information support provides a constant broadcast of all safety-of-navigation information. There are manual updates made to products, but there's also a constant update of the database, so we can reprint what we need to reprint on a periodic basis.

The terrain elevation information is pretty static. There is not a whole lot of change in the surface of the earth. The reality is that we had very little of that information at the resolution level needed for the foundation data until we flew the Space Shuttle mission with NASA [National Aeronautics and Space Administration] two years ago last February. We are now processing the data. These are the data that we are using to support Afghanistan. Regarding the update of some other elements of the foundation data, it is important that we start to look at better ways to make controlled imagery a more current product.

**Student:** How long does it take for a controlled image that reaches your office to get into the server? I would suspect it would be based on need.

**Lenczowski:** Yes, it's based on where the operation is and what the particular requirements are, although we have a near-global responsibility to build this product at a five-meter resolution. We're trying to look at a better way to provide an even higher quality product by working with commercial imagery vendors, because the current higher resolution version of this standard product is classified. The five-meter is unclassified, and we can get one-meter resolution from commercial imagery, which is fully unclassified.

We're working with our commercial vendors to say, "When we order commercial imagery from you, we'd like you to produce it for us in this format as soon as you have it." This is an image processing activity. It is computer intensive. It does not take very long to produce that product. So once we know we need it—if we have the imagery, and that's a big if—the interval between having the imagery and generating that product and getting it out on the gateway so it's readily available can be as short as two weeks. We've done that for crises, because we have contractors who are able to support us in that particular activity. Again, we're either doing it as a crisis or as part of our routine production.

What we look at as we move to the future is the concept of a dynamic database. We are working in the R&D community to capture the concept of how to create dynamic situation awareness. There is a joint R&D program by the Defense Advanced Research Projects Agency, NIMA, and the Air Force Research Laboratory to develop technology for dynamical situation awareness through fusion of data from multiple sensors and geospatial information. You have foundation data and mission-specific data, but in real time you also have multiple sensors that should be able to provide you some update of very current information. In the dynamic database kind of environment, that information is incorporated with sensor data, and this is updated simultaneously to create a four-dimensional picture of the situation. That means that we have time-tagged it, so it's not just the X, Y, Z of the environment, it's also the time tagging.

To do the fusion, you take the terrain elevation information, lay it over a controlled image, and add on other data, such as data about soils. Depending on what's in a database, all those kinds of vectors and attributed information are incorporated and blended within the computer environment. If you visualize this merged and fused information, it would certainly convey more information than any one of those things by itself.

We support the IC [intelligence community] as well as the DOD. We have other responsibilities that extend beyond military and intelligence functions on the maritime side.

In our transformation activities, we are looking at a whole suite of standard products and services that we have provided and how to create geospatial intelligence in a holistic fashion. These are all things that we do, and we have historically evolved to do them. Many of them are stand-alone production processes. We want to be able to merge all the information into a data environment such that if you want a particular tailored or standard product I can give it to you, because the database can support it, but my objective is not necessarily to build that product.

It changes the way we do business. It changes the way we deal with our contractors. As opposed to assigning them to build the foundation feature data product, for instance, and then later build another product that has standard map information, both types of information are incorporated into that product. So why not build the database and from that database print the product or distribute the information electronically?

**Student:** That must be the fundamental challenge when you're going from a push to a pull framework for doing things. How do you budget for that, or assign value to that, or prioritize?

**Lencowski:** In the traditional approach, and even in how we did these standard products until the crisis, we had a very rigid requirements process in place with the DOD for the geospatial products. There's actually a Chairman of the Joint Chiefs of Staff Instruction, 3901, that describes how geospatial requirements are identified and prioritized.<sup>1</sup> As we start to move into a future environment where we populate a database, we have to revise our whole approach to how we approach the requirements process.

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<sup>1</sup>Chairman of the Joint Chiefs of Staff Instruction 3901.01, *Requirements for Global Geospatial Information Services* (Washington, D.C.: Office of the Chairman of the Joint Chiefs of Staff, 24 May 1996).

Many of the recommendations have said that we should look at it more the way the IC looks at guidance embodied in PDD [Presidential Decision Directive] 35,<sup>2</sup> where the important regions or issues are effectively prioritized and you allocate your resources starting at the top and use them until you run out of resources. That way there are some things that just don't get done. This year's production program within NIMA for the geospatial part of the program is not at all what we laid into our business plan this past summer. Many of our customers are agonizing about "But you promised that you were going to give us *that!*" The reality is that we have focused all of our assets on ensuring that those whom we are sending into harm's way have the best information we can provide, and who's going to fault that decision?

**Oettinger:** This will be examined a year from now when the next crisis hits and so forth, and somebody will say, "How come you were not doing...?" These are hard decisions.

**Lenczowski:** We all know of situations in the past where there was great criticism because something was missed, and it was missed because there weren't many resources focused on that issue. The reality is that if we look at where the resources were focused, they were focused on what people thought were the highest priorities. So that's again part of the risk management activity you have with limited resources.

**Student:** I guess one of the criticisms of using PDD 35 is that if you go back over the last ten or fifteen years, most of the places where we put our forces into harm's way were not on the list. Afghanistan was not a tier 1 transnational issue, and it was kind of tough to do map production. With that as a prelude, I know that once upon a time there was a plan to have NIMA libraries that were accessible to the unified commands, and that they would in fact take responsibility for some of that delegated production.

**Lenczowski:** You're referring to a concept that we call unified operations. We fleshed it out a bit more on the imagery intelligence side of the house, because there we tend to populate the same kind of database environment, although the imagery analysts in the commands are populating something called the IESS [Imagery Exploitation Support System] and internally in the NIMA we populate something called the NES [National Exploitation System]. Those databases link up structurally, and we feed information from the IESS into the NES, and vice versa. We lack a comparable model for the geospatial information. It's clear to me, particularly when we have Army individuals on the ground who are trained analysts and who have some really good up-to-date information and want to put it into our data holdings, that we have not yet built a robust way to get that information back. However, there is right now a developmental activity under way that has as one of its requirements a mechanism to allow that added value to come back in. So the communications now need to be about not only how we can push things but also how we can pull things from people who are sitting out there, or how they can push them to us.

**Oettinger:** To me, that's the absolutely central point. I've been itching all along for an opportunity to ask you about HUMINT [human intelligence]. Whom would you allow to fold your parachute? In the transaction world they don't trust data unless they are gathered by

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<sup>2</sup>Presidential Decision Directive 35, *Intelligence Requirements* (Washington, D.C.: The White House, 2 March 1995).

somebody who's got to use the data in daily operations, and profit and loss depend on those data. If it's anybody else, it's like meter reading in the utilities: the guy sits in a bar and has a beer and invents some figures and puts them out. That was a classical utility problem until they figured out that they were better off only doing it once every six months and extrapolating the numbers on the computer than paying some guy to invent numbers while drinking a beer. Now the question is that if you've got people on the ground, and they need to use these data, are you going to get better data if you populate your database with stuff that comes from people who are folding their own parachutes?

**Lenczowski:** That's right. On one of my visits to JAC Molesworth I had an opportunity to talk with a couple of terrain analysts who had just returned from Kosovo. They were describing the information they had gathered about some of what I call the transportation network, which was under heavy tree canopy. Our sources don't see that unless we happen to be collecting in winter and there's no foliage on the trees, so that was incredibly valuable information. I asked them: "So, what did you do with that information? Did you get it back to NIMA so we could put it into the database?" They didn't even know how to do it.

We have people distributed around the world whom we call technical representatives, whose background is geospatial information. The first thing I could do was say, "I would like you to come over to this part of the facility at JAC Molesworth and meet this person. He is a NIMA person who knows about geospatial data. I want you to make sure that the information you gather can be given to him, because he can get it back to us." That happened to be circumstantial. There was nothing institutionalized about that.

**Student:** Am I hearing you right—that there has not been any way to get feedback in? I was actually in a briefing during the summer by a NIMA guy, and the analysts didn't know what that process was, but we had people inside who knew exactly what it was. As far as I knew, that information never got outside that meeting. He kind of said, "Well, tell me when you get back." After that, I seriously doubt anyone called him.

**Oettinger:** It's question of balance. Take a commander of a unit who has a mission to accomplish, and somebody says, "Oh, by the way, take X people, and we'll have them taking notes while this is going on, because we want them to feed back information to answer a question." Prior to that, one could imagine a situation where that becomes a top priority, and that along with the logistics and the operations you have a data gathering and feedback unit. I don't know of any military service where that has become a priority.

**Lenczowski:** There are fewer and fewer people in those particular military occupational skills who have the proper background. In nearly every service, they have drawn down on the people who have geospatial expertise.

**Oettinger:** Yes, although for anybody who carries a GPS [Global Positioning System] receiver, it's a matter of clicking and saying, "Here I am!" Just think of the surveying skills that got replaced by having a GPS receiver.

**Lenczowski:** How many of you here have a GPS receiver, or have used one? I have a really cheap little one. It works with some of the readily available commercial software and data, and I

put it on my portable computer when I'm driving. When I travel across the country, it's great fun to watch it. But its accuracy isn't 100 percent, and I know that. And because I know about the processing of the GPS orbits and some of the problems associated with the system and the limitations of my receiver, I know you've got to be cautious about relying on it. I have to know that you were collecting the data with a particular kind of receiver and that you described where you were very accurately, so that when I take the coordinates you gave me and I have a picture I'm sure that I'm right at that intersection and not over at the other corner. That is very time consuming. If you talk to military people who are employed in taking care of the operations intercepts, it adds a burden.

Those are the kinds of data challenges we have. I can write wonderful theoretical papers about how this all could work, but I know that you always have to introduce people who have real jobs to do into this scenario. So the problem becomes that you know someone is sitting there who says, "I know what that is." But if it didn't get captured exactly at that particular time and somebody was not aggressive about making sure that it got into a database, it's information that is lost, even though somebody had it.

**Oettinger:** If you need any additional proof that information is not disembodied and free, this is it. It's expensive to gather and it's a hard-to-maintain commodity. It's got tradeoffs with everything else.

**Student:** Actually, that speaks to the heart of the debriefing problem that the intelligence community at large has. All the services and all the national agencies have the same dilemma. There are so many people traveling to so many different places doing so many different things that you can't possibly sit down with each of them and track down that amount of information. The special operations community prescribes it to a certain extent, but it's not clear to me that they've been completely successful either. They do have a standard debriefing format that each of the Army Special Forces units fills out. I don't know if it's true of the SEALs [Navy sea-air-land units], but at least the Army sits people down and they have a fairly detailed debriefing following the chart. I guess the Special Operations Command [SOCOM] does something similar, and it gets fed into something called the intelligence information reporting database, but it's a SOCOM-run database and I don't know if NIMA has access to that.

**Lenczowski:** Probably not.

**Student:** It's probably manually intensive to put that information in.

**Lenczowski:** But, as you also pointed out, we may not have access to it. You have to remember that the community recreates the current walls. More than just computer firewalls, we create actual restrictions on who has access, because some of the information that is fairly collateral, fairly general, and could be incorporated is interspersed with lots of other information that is very sensitive. The resulting collective information can be more highly classified than any of the independent elements.

**Student:** It's a good illustration of the tradeoff between HUMINT and other systems. You talked earlier about the commander's query about finding a bed-down site within certain parameters. The database will never spit out any information unless you ask a specific question, whereas if

you ask a camel driver where he spent the night you might get insight that comes out of experience. So human minds and lives and memory, with all that goes along with them, still have a key role in the process.

Going back to what you discussed earlier, I wanted to ask you whether there are any commercial paradigms that you use to measure demand for the future. You were saying the PDD ways are so reactive. Is there something in the oil exploration business, or the agriculture business, that would be a model for trying to figure out future demand?

**Lenczowski:** What has always made looking at what happens in the private sector rather difficult is realizing that there is one motive that we do not have in the government, and that is profit. We talked about that a little this morning.

**Student:** But is there a way to introduce that bureaucratically? Could the commander have some sort of budget for this?

**Lenczowski:** A model we have looked at before with respect to certain geospatial information was, What if it were something that we provided on the basis of who brought dollars—if we “sold” the data for credits within the government? I get a lot of pushback on that, as one might imagine.

**Student:** I can’t imagine the unified commands doing that.

**Oettinger:** It’s very fundamental. To go back to our discussions about the statutory structure, procurement and the fielding of forces are prerogatives of the military services, under Title 10 of the U.S. Code. The services do not necessarily know demand. The ones who know demand are the CINCs [commanders in chief], the deployed soldiers, et cetera. Under Goldwater–Nichols they have some additional money, but not enough to do that job.

**Student:** I’m asking about money, because it seems that it’s the currency of demand, in the sense that Google as a search engine looks for relationships in the things it searches to try to find out what is relevant. If, for instance, one of the commands were contemplating an operation six or nine months from now, you and your team ought to get a head start in asking questions about that in a way that would provide some predictive information, because of the queries coming in about what might be the most likely area of interest for the future.

**Lenczowski:** You don’t usually have nine months’ advance notice. You do if it’s an exercise. That’s an entirely different situation. One of the things we have asked for is to be involved much earlier in the process. When the planning orders are being thought of, before they’re even executed, we need to be called, so that we can perhaps start to put that into the mix of our production and analysis work.

Industrial-type funding has generated a really interesting controversy. We can look at other countries’ models, as opposed to only looking at business models. For instance, if the British military need data over the territory of the U.K. [United Kingdom], they have to buy it from the Ordnance Survey. They do not get it for free. It presents rather interesting studies as to whether it’s effective or not. As a matter of fact, the U.K. had to modify what they thought would merely

be a ledger exercise. It turned out to be a rather contentious exchange, because, clearly, if you need the information for military operations, you *need* it for military operations, and what happens if your bankbook is empty?

I think the debate will continue for a long time, but one of the things that we know about many of our geospatial products is that they can be produced by the private sector, and that's why we continue to look increasingly for different outsourcing opportunities. We, of course, are the brokers for that information. You could think of a model where the private firm both produces it and sells it. The difficulty is always that we have a global responsibility, and the private sector will go where the dollars potentially are. They'll go to the high-interest parts of the world, but we may want to go to some not-high-interest part of the world or where it's really hard to get coverage or a source. That's what government does: it underwrites that part of the business.

**Student:** You just hit on a key point. That's one of the reasons why we've done so much more outsourcing recently than in the past. If you go to experts and say, "Hey, I have an uncertain demand," or "What's your business model?" these are the guys who tell you, "Oh, there are five different business models for imagery." They'll tell you how they would respond to your requests, and oftentimes that's part of the criteria for selecting whom you'll outsource to. You can write very flexible contracts. One of the criteria is how they're going to respond to uncertainties.

**Student:** Are you thinking of a move to a regional geographic concept or model in the near future? Could there not be some synergy with the J-2 [intelligence] staffs, or the strategic planning staffs, all of whom the CINCs own, so that they marry their data with your products and bank those for Operations Plan XYZ? If you go to a regional focus, the combatant CINC ought to be all over that in terms of developing his plans.

**Lenczowski:** That's right. What's interesting is that you mentioned the J-2. We deal with the J-2 on the intelligence side, but we deal with the J-3 [operations] on the geospatial side in some (but not all) cases. There are certain commands where the J-2 handles both the intelligence and the geospatial, but there are other commands where both the J-2 and J-3 are involved.

**Student:** My point is that as they do their strategic planning, if you want to front-load your product as they do the war plan, your customer base on the CINC staff may very well change from the current ops guys—J-2 and J-3—to the J-5, the strategic planners.

**Oettinger:** That's a fascinating comment. That goes back to that slide with the nature of the business [Fig. 3]. There's the geographically certain stuff, et cetera, which the operations person would not regard as intelligence. It's just a fact, not like the fuzzy stuff that goes to the J-2. It's real stuff for real people.

**Student:** Moving away from the functional, I have some questions about the actual philosophical problems that you've encountered. When you're not using NTM [national technical means], where does the separation come from your previous motto about keeping the edge? You're now subjugating yourself to business forces that might or might not know other ways of doing things, and you're basically competing in a different ballpark.

**Lenczowski:** I think that has changed somewhat, but not entirely. When I talked about the readiness and responsiveness postures, that readiness posture already had a plan built against it that said, “I need X number of what we call cells (one degree by one degree—sixty nautical miles wide by sixty nautical miles long) on the face of the earth.” We knew what the prioritization of those was, and we were building against that. The optimization there was based on the operations plans or the communications plans. That became the prioritization strategy.

As we’ve gone to the database approach, right now we are clearly focusing on the crisis, because the crisis introduced an entirely new, disruptive concept in terms of how we were approaching strategy. The reality is that the information edge is not our main concern. What we’re doing right now to support the crisis is very ad hoc, very focused upon our customers’ need for standard paper products, and that’s what we can produce out of the databases that we have built. What we need to be able to do, with respect to the information edge, is go back in and do maintenance on those databases. We have to introduce more accuracy, more currency, into the databases. We won’t have to add a whole lot with respect to greater density of features, but there is a maintenance responsibility, which is where the “edge” is going to be. It’s back to that discussion of decision superiority. We have to provide all of the salient elements of information, to the highest quality that we can, to reduce the ambiguity for the decisionmaker.

**Oettinger:** I think that response underscores a broad truth for the foreseeable future. Twenty or thirty years ago, one might have been able to talk about a U.S. edge in technology or a monopoly over technology. It’s gone, partly because of dual use and commercialization. You have to assume that everybody has the technology. So where does the edge come from? It comes from how the technology is used, as in maintaining databases: doing things better and in a more timely way than someone else who has the same technological infrastructure. Then you can’t help having a technological edge.

**Student:** What other technologies are contributing to the geospatial toolset? Is there anything else out there—a field that you’re watching to contribute more speed or something?

**Lenczowski:** Ever since I’ve been tracking this specifically for the agency, the community at large has invested a great deal of money in R&D efforts for something we call automatic target recognition or automatic feature recognition. We got smarter, and we kept the acronym, but the “A” now stands for “assisted.” The reality is that, with the advent of the higher resolution, multispectral imagery we get from commercial sources, we are seeing opportunities for some breakthroughs to help us improve the speed of extraction.

This is as good a place as any to discuss some examples of what I mean about how to take advantage of the multispectral characteristics. We tasked for commercial collection to show the Venezuelan flooding. (We got started in this when Al Gore was vice president. He had a lot of interest in environmental issues, so any time there was anything happening environmentally we paid attention. His question here was, “Is the flooding disaster a result of the deforestation in Venezuela?”) Multispectral imagery was able to give us a quick look to help determine where there were forests or vegetation. The net result was that we could demonstrate that the flooding was not a direct consequence of deforestation; there was much damage from mudslides as a result of all the rain that one might have attributed to deforestation, but these were not deforested areas.

Many may not understand our contracts with the commercial imagery providers. When we buy Ikonos or Digital Globe, we use it under a license. We never own the imagery. The imagery is still owned by the vendor. We typically provide the imagery for our Title 6 or Title 10 users, and we can also license it for coalition use. We can buy it for the general public, but that gets very expensive, because, obviously, if we put it out to the public, the producers have lost their secondary sales market.

We used Radarsat's collection to support analysis of the flooding in Mozambique. Radarsat is another commercial firm that uses radar, which is very good with water delineation. We can insert the symbology, some text, or elements one finds on standard graphic products.

We also took our elevation data, and we said, "Okay, what if it keeps raining? Where is the water going to go?" We built visualizations that were speculative projections of where the water might go. In that case, because the Ikonos imagery is more literal than the Radarsat, we prepared products with the commercial panchromatic as the base upon which we could overlay the predicted flooding patterns.

**Student:** Do you still have shutter control over another set of capabilities? There's still a certain control that one maintains over technology and the technological edge. As soon as you start subcontracting out at the beginning of all this, you lose that control, or am I wrong?

**Lenczowski:** I have to follow your logic through this in terms of control over technology. The issue is that you have to decide what level of control the government wants to exercise over the technology. In this particular case, with respect to the commercial vendors of imagery, we really do want a very robust U.S. industry. We'd much rather it were a robust U.S. industry than a robust foreign industry.

So how do we go about doing that? We say that we ought to let the private sector develop technology to the ability it can. The U.S. government's control on that may be that they can only sell what is competitive. In other words, what is commercially available is at least as good as or slightly better than what any competition in the foreign sector is selling, but it's not as good as it could be. Maybe only the U.S. government has access to and use of that really good stuff. So it's kind of a tiered approach, as opposed to "shutter control," which is a whole separate discussion. You can only exercise shutter control in the United States over U.S. assets. So what do you do if India has a one-meter system, or Israel, which is certainly likely to have a one-meter system shortly and currently has a system that is better than two meters? What do you do about SPOT, which will have a two-and-a-half-meter system this year?

**Oettinger:** Any final thoughts?

**Lenczowski:** I hope that you understand the really broad scope of the things that we are responsible for in terms of the whole information environment, and that we are evolving at a very rapid rate. There is no doubt in my mind that 9/11 has been a catalyst for changes that we have talked about for a period of time, believing that they were the appropriate thing to do.

When I flew up today I was reading an article in *The New York Times Magazine*. It's a report by Bill Keller, who had talked to Admiral Cebrowski as well as to Andy Marshall about

the distinction between defense transformation and the revolution in military affairs.<sup>3</sup> Over the past several years, I have had an opportunity to brief each of them. Mr. Marshall wasn't then in the job he's in now, and I must admit that when I went to brief him I had absolutely no idea what his overall stature was. (That's how naïve I was then in terms of the influence he has had upon thinking.) When you look at some of the things that Andy Marshall says, or the things that Admiral Cebrowski says, at the foundation is an understanding that some dynamic changes have taken place. Regardless of what you believe about the future defense infrastructure—whether it's lighter and more agile or whether it continues to do what it has always done because it knows how to do it—the trend is to continue to get more and more into the information arena and to take increasing advantage of information elements.

Our responsibility is to attempt to make that information sharing as easy as we can. We're working with legacy systems. We're making modifications to legacy systems. We expect to improve our data for the troops and to continue to work in the standards arena and take advantage of commercial activity that's standards based.

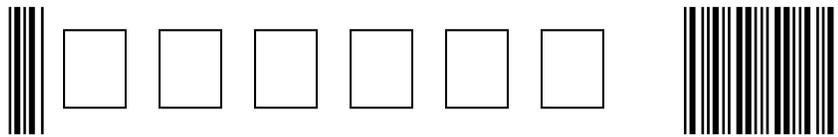
**Oettinger:** On that note, may I give you a small token of our very large appreciation?

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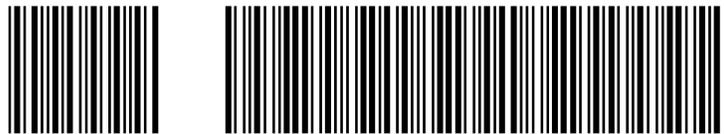
<sup>3</sup>Bill Keller, "The Fighting Next Time," *The New York Times Magazine*, 10 March 2002, 32. Vice Admiral Arthur K. Cebrowski is director of the Pentagon's Office of Force Transformation; Dr. Andrew W. Marshall is director of the Pentagon's Office of Net Assessment.

## Acronyms

CIA	Central Intelligence Agency
CINC	commander in chief
DIA	Defense Intelligence Agency
DMA	Defense Mapping Agency
DOD	Department of Defense
GBS	Global Broadcasting System
GIS	geographic information system
GPS	Global Positioning System
HUMINT	human intelligence
IC	intelligence community
IESS	Imagery Exploitation Support System
JAC	Joint Analysis Center
NES	National Exploitation System
NIMA	National Imagery and Mapping Agency
NPIC	National Photographic Interpretation Center
PDD	Presidential Decision Directive
R&D	research and development
SOCOM	Special Operations Command



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