DR. STARNES WALKER: Thank you. Well, actually this was a good segue to talk about some of our success stories and the importance that the work that CREATE has been doing to scope out the areas of vulnerability and, as we just heard, the areas of seams where vulnerabilities occur. And understanding that gives us at least a measure for what areas we ought to try to focus on that are extremely important for enhancing the nation's

security and global security. So I think the -- I continue to look forward to see more and more work coming from CREATE that will help guide us in the future in the areas that we would like to look at. And also we could overlay the discoveries in science and technology that we would see that we perhaps could have solutions in a reasonable time frame to address these vulnerabilities, but also what areas of investment we should make in phenomenologies that are beginning to mature, become exciting, where we see things that would be derived from those discoveries. So think that's an area that we're excited about, and I brought forward a few examples.

The other thing that I think that we had just heard too that -- the complicated areas of how society works, when you think about within the United States and within Europe, the Baltic areas, you have the -- in the United States we look at 18 different sectors of how our society operates and the overlaying of electrical power and natural gas distribution, energy, water, all of these things. And each of these systems, maybe it's a simple way to look at it, but I've always looked at each of those infrastructures as being kind of a two-dimensional plane, let's say, and they have critical nodes of how they operate and those vulnerabilities of

those nodes. And then if you were to then construct a three-dimensional model where you overlaid 18 different planes and then you look at a ripple effect of if I attacked one node of industry or economy and how does that ripple and affect the other sectors? And then you begin to define maybe there's more of a strategic thing that you have to make investments in that if we could solve that problem, then make it reasonably what we'll call a hard target where it's difficult to breach that and cause a disruption of society and harm for our populations, then that would make good projects to look at and see if we can move forward with. I brought forward a couple of examples that we have underway, and we have many more. And from an organizational standpoint it's kind of an overlay across all three sectors of transition, innovation and I'll call it basic research, or research, where we find there's an opportunity for all of this to come together as we address some of these critical vulnerabilities that come from the analysis that we have just heard about. See if we can call up the -- I've got a few slides here if we can bring those up. If not, I can walk you through these verbally. Doesn't look like they're going to be able to find that, so I'll start off talking about each of these individually then. One is our program we call

resilient tunnel detection. Or demonstration rather. All across the world we have a lot of tunnels that are used in different modes of transportation. And the construction and materials used make them sometimes vulnerable to both either a natural disaster or a man-made disaster where explosives, as an example, could cause a breach of the tunnel. If that were to happen, then how would it be possible for us to retard the flow of water into those areas? And this is an area that we have a program underway right now where we've been working with international partners, with West Virginia University, where we could take a look at some of the advancements in materials science, and sensing of course of a breach, where we could provide a plug that could be expanded volumetrically very rapidly so that it would stop the impeding flow of water into this area so we could restrict the amount of damage and the loss of life that would occur as result of this breach. And of course I'd like to remind everyone that as we make further advances in materials science, then the ability to withstand or withhold higher back pressures of materials and water, it's only going to become better. So having a demonstration where we could see how rapidly a plug could be deployed and how effectively it would be in retarding any type of fire and water, smoke and other

things, then this would be a very useful thing to have in our arsenal of reducing vulnerabilities of some of these critical nodes. So this is I think something that we'll probably see products being developed rapidly, but also improvements as we make more discoveries in materials science.

The second one that I would like to talk about is again with international partners, and I started my discussion off with the fact that we do have to worry about both natural and man-made disasters. One of the things that's very difficult is in the areas of hurricane science. As you know, we've all seen the disaster that occurred with Katrina. And with the other areas of typhoons and hurricane predictions, we don't really have everything understood well enough from the basic science that allows us to predict with a much higher degree of confidence either the strength or -- the growing strength or subsidence of hurricanes or typhoons. Likewise, I'll call it the cone angle of onset onto a shoreline, being able to say where that is going to hit a shoreline. We could do a lot better job. But here this is an example of where we can be working with international partners, with NOAA, other government agencies that we can take a look at how we could get more sophisticated measurements and better models that

would allow us to understand these issues. And this is only going to come from better atmospheric and ocean measurements. As you probably realize, the growth or subsidence of storm many times depends upon the temperature of the ocean, but then you have to worry about the mixing that occurs, the wave action. There's all sorts of very complicated phenomena that go on that really control the amount of energy that is going to be placed into that storm and how it's going to be retained or dissipated. So we have a very good program underway now for making more sophisticated measurements, running these into the models, and then going through -- I'm sure that these type things from a CREATE standpoint, you begin to do what we call parametric systems analysis, and you do sensitivity studies to understand what are the critical parameters that control the growth or subsidence of storm. Likewise, if we were able to better predict that and the onset, then if you have very precious resources to be deployed, government agencies, state organizations then would be able to more effectively safeguard both the infrastructure and save lives, because you only have a limited amount of resources. If we can deploy that more effectively, then that would be very good. So that's the second program we have underway that we're very pleased about.

The third one, example is of course I think we've all heard about the issues of border security and being able to either be able to control and understand the movement of elicit goods or the movement of human people, of people moving back and forth in a covert manner. If we could -- and many of these occur through tunnels. Many times, as you know, it's very difficult to discover these, and we surprisingly see these show up, but if you could imagine being able to look at a clandestine type of tunnel that has been structured, then all of a sudden you have to worry about the soil composition, moisture, technology such as ground penetrating radar or very sensitive gravitometers, breakthroughs that we make being able to look at voids and either acoustical or physical sensing and monitoring. We don't have all the tools, so we're working again in partnership with universities, international partners, so that we can do a better job. We don't have the solutions that we have today, but with the advancements in new types of sensing technologies, data fusion, because there's probably no one single sensor but many different approaches, bringing that information together would allow us to be able to discover the use of these tunnels that again, if you can bring -- of course, a lot of it is to bring drugs into countries, but you could also bring bad

people or weapons of mass destruction. So it's very important for us to be able to have technologies to be able to control and enhance our border securities for any area, any nation. So this is a third program we have underway, and again it's international in scope and it reaches across other government agencies as well as with academia. So this is I think an exciting area, again fertile for discovery, and it's again looking at ways that we can help protect and enhance the nation. The last one that I'm going to discuss will be the one on the -- we talked about the resiliency of infrastructure, and we also have heard over the last two days the concern we have with the terrorist's choice weapon of improvised explosive devices. A lot of people are harmed by the breakage of the glass and the shards that are created in an explosive detonation as that shock wave hits a window, breaks in fragments into very small pieces of glass that are moving at high velocity, and they literally can cut you in two. So a lot of people are harmed by that. So if we could come up with a composite window that gave us the optical properties that you all desire and maybe even good thermal properties so that they're, as we would say, a low E window, "E" being E massivity, but providing good energy parameters for new construction, but also would not be

fragmented upon detonation. So we again have a program underway using advancements in materials science, international in participation, and at the same time taking a look at how these new materials that are being developed, how those would be then placed in. So we have a testing program underway that looks -- I think we're going to see some exciting breakthroughs, but again it's how can we make the infrastructure more resilient, how can we protect people. So this is something that we're trying to accelerate in our demonstration program.

These are four examples of many that we have underway. Again, I think the work that CREATE is doing allows us to quantify in a better way let's work on the ones that seem to be the most serious in terms of how it will affect society and how more people could be harmed and we have solutions. Let's pick some demonstration programs where we think we've got a good, solid science footing. We also see that there are discoveries occurring that may be able to be addressed and shown to be very helpful in that, and then move forward with these projects. And, again, it's something that integrates across all of our directorate where we have innovation. We have our six divisions that become involved, and likewise we bring in university programs.

As you know, our Centers of Excellence, as I said yesterday, encompass about 240, 250 academic institutions, with reaching out internationally as we just heard with CREATE -- this is true for all of our centers -- and we are looking at emphasizing the importance of international collaboration. So I just wanted to give you at least a cross-sectional view of four areas that we're working on. And as we see other opportunities, we're going to continue to have additional demonstration programs which brings the international community together in a way that improves and safeguards all of our nations. So I guess with that I'll stop and probably be able to have a little bit of time for some questions. Thank you.