Discussion on Friday 10/9/2009
What research is required?

Doug Bauer – We are entering into an era in which budgets for research will be very tight. This will be especially true by 2011. (The situation in 2010 will be pretty similar to now.) The tight research budget is because of pressure to balance overall federal budgets to reduce the huge deficits we are experiencing. There will be an increased premium on the value of research that leads to a specific use. This is a difficult walk because fundamental research has an underlying characteristic, viz. that it takes longer to mature enough to migrate into general use to fulfill a customer requirement. Fundamental research (what the Centers of Excellence & Universities do) is high risk, research that generates a reasonable number of mistakes enroute to providing new means to meet customer requirements which can't be met with current technology. We need to walk a tightrope to preserve <u>fundamental</u> research funding while demonstrating more clearly its connection to customer need.

The budget tightness in FY2011 and beyond will require us to be clearer on research connection with customer requirement. We will need to show how research connects to usable technologies, if not immediately, then 4 or 5 yrs down the road. This year, for the first time, I have to justify all the *basic* research that the Centers are doing to our "transitional" customers. The government will emphasize research that can be transferred into a use – soon, if possibly, but eventually, certainly.

So, we need to balance the satisfaction of customer requirements with preservation of a safe domain for high risk research. That won't be easy!
One of the marks of higher risk research is that some times things do not work out. If a technology path is not working we need to exercise the courage to change its emphasis to something else that holds promise of working.

<u>Implications:</u> There will be a higher premium on active collaboration & maximum leveraging of tight resources. I was impressed to learn about other groups working on things that help DHS. We want things to be interagency, collaborative, & reflective of connections between university, vendors, & other entities. It is no longer a linear process where we do the basics & fundamental research and then hand it on to "transitional" organizations to take the last commercialization steps before handing it over to industry. Now everyone must be able to work on all levels/aspects of a problem. We have arrived at the end of insular communities doing their 'thing" in the hope that the process yields usable results. We need collaboration both *within* the conduct of the research and *between* research and users.

We are at an end to anecdotal research. Research must be aligned with well articulated *strategies* to meet customer requirements now and in the future. Stated in another way, our research description and advocacy must be more of a narrative

(or story) that laypersons can understand. The current level of scientific understanding in Washington is very low. There is less of an affection (or even understanding) of science for science's sake than in past years. Thus, science proponents must be able to describe their science in terms of its *effect,* i.e. its importance in closing capability gaps in ways laypersons can understand.

What is the government looking for? I was very impressed with the last presentation by AS&E – Mr. Callerame dealt directly with the question of what to *combine* x-ray backscatter *with* to get better overall detection. We are moving toward combinations of technologies – admitting the limitations of any individual technologies taken alone. However, we need thoughtful, fundamental work in applied mathematics and other fields to determine *which* technologies are best to combine to get best overall effect.

We need data analysis to get better predictions of abnormalities – how to get an earlier warning of the threats we face, how to develop new visions. If we stay in the viewpoint of a world on checkpoints then we have lost the war. We want to fight it further to the left of the bang. There is a need to look through boring data to figure out where the threats might be. We want massively distributed systems to give us a chance to be a bit luckier and catch people a bit earlier.

We need technology assessment. The government does not have good technology assessment. For example – terahertz – how long before we decide what is realistic? The same is true for millimeter wave technology. For liquids in bottles – RAMAN has limits. What, if anything, can be done to overcome the inability to go through opaque containers. Neutron interrogation – how long do we pursue it? How long before we say that we have no clue how to test pallets and find something completely new? We need the honesty to say enough is enough.

We need instruments that have multiple uses. In the 1970s, when energy was the big issue, what was worked on depended on the concern of the month. An example in security is glass – why is there no effort to make glass that would shard less to increase survival, be highly energy efficient, be cheap, and be able to be installed on existing as well as new structures?

HME novel threat characterization needs to be looked at. I am humbled by what we are learning every day about different unconventional threats that we are facing every day & by how much we do not know. We need to be better in our ability to predict characteristics.

We are restoring the balance between fundamental research, applied research, proof of concept, development, & testing, etc. We need to see them as not being linear. We need to be literate in all aspects of the process. We need to be able to describe to anyone how any part of the chain adds to the value. If JIADO is getting a ton of money then one of the arguments to fund DHS is lost – that we need money for fundamental research.

In addition to the research enterprise, wherever we are doing research, how do we make sure that the development opportunities provided in universities, colleges, & K-12 institutions are enough to interest students & get them involved? This is not just OK to do, but is part of our mission.

If we have limited research do we spread ourselves thin or do we redistribute funding to those things that will give us the highest returns?

Oct 9, 2009 Notes by MT

Doug: The landscape looks like federal support in the coming years will guide activities. The center facilitates the collaboration between universities and businesses. The context we are faced with is that budgets will be tight in the fiscal year 2011. The pressures on the federal budget will be bipartisan. It will be tough for research. There will be increased pressures on the value of the research we do. We will need to focus on customer requirements and contracts with customers. Gaps in capabilities of the current technology will not fix current problems. Premiums in research will shift from the anecdotal to narrative. Also, it will be necessary to protect safe domains for high risk research. Sometimes things don't always work out – we need to admit that some research doesn't work.

There will be increased pressure on active collaboration resources; research collaboration, inter-agency research, university & vendor & natural laboratory & third parties. We need active continuous research. The level of current scientific literacy is low in D.C. For the next 3 years we need to speak to the layperson on their level. I was especially impressed with the last presentation because it considered the mixing of technologies to solve a problem.

We need to consider analysis: we need to focus less on turnstiles and move "left of the 'bang," and we need to re-envision both our threats and the means best to protect against them. We need to think of massively distributed sensor systems which might catch a terrorist much further upstream. We need to enhance our chances to be a bit luckier in foiling such a threat.. We'd like to see new research proposals that help us find ways to be "a little luckier." We also need *technology assessments.* We need to see the limitations in any of the technologies we have been traditionally supporting and, as the case may be, admit failure. We need to see when enough is enough – and when to refocus our research energy elsewhere. For example, we need to see the limitations of Raman with regards to bottles, and how long will we pursue acoustics?

We need to focus on dual use; to find multiple benefits from one technology. We need to find different values for one technology. For example, glass: 1st it should shard less to increase survival, 2nd it should be energy efficient, and 3rd it should be cheap and easy to install in existing buildings. We are overwhelmed by the nature of unconventional threats, and what we don't know about them. We need to be smarter, better, and coach how to use technologies to solve problems. We need fundamental research, proof of concept, independent testing, and evaluation. We need to be able to explain the whole chain of research and explain how each piece adds value.

We need to devise opportunities in universities and from kindergarten to twelfth grade to excite students and encourage them to be in science and technology fields, and ensure they are educated & useful when they enter into such fields. We need to try to get students interested in fresh discoveries. We need to add to the educational value of students. Overall we need to decide, do we keep spreading ourselves thin? Or do we redirect research to what is likely to be successful.