

12 DR. DETLOF VON WINTERFELDT: Thank you very much, Bengt.  
13 It's kind of like coming home to me, both in terms of  
14 coming back to Europe in Luxembourg -- Austria where I'm  
15 residing in a beautiful castle -- and also coming back  
16 to homeland security which I haven't really worked on  
17 for the last eight months, nine months or so. I will  
18 talk primarily about CREATE and some of its experience  
19 related to international work as well as some of the  
20 substantive work that we did, and occasionally I might  
21 touch on my new experience at IIASA, but I can tell you  
22 that managing an international institution is a lot  
23 tougher than managing a national institution. And it's  
24 not only those pesky Europeans that I have to deal with,  
25 but I also have to deal with Russians and Japanese and

1 Koreans and Chinese and Indian and Pakistanis and South  
2 Africa and Egypt. Now, "having to deal with" is maybe a  
3 little pejorative. I enjoy it tremendously.

4 So what I'm going to talk about today is some of the  
5 activities that occurred at CREATE over the last six  
6 years. CREATE is, as you may know, was the first Center  
7 of Excellence funded by the Department of Homeland  
8 Security. Actually about six years ago exactly we  
9 submitted our proposal for CREATE in response to a basic  
10 ordering agreement -- a basic agency announcement that  
11 was sent out in August of 2003. And there were 72  
12 competitors. 72 universities wanted to get into the  
13 homeland security research business. And I actually had  
14 thought at the time that I would do this only for  
15 practice to write this proposal, because I was really  
16 interested in the fourth call which was for a behavioral  
17 center. By background I'm a psychologist and a  
18 mathematician, so that interested me. In any case, much  
19 to my surprise, we won. We had an interesting mix of  
20 engineers, economists, social scientists, and I don't  
21 know if you all remember the gentleman to the very left,  
22 but he was the first Secretary of Homeland Security,  
23 Secretary Ridge. Then Secretary Chertoff, who was  
24 secretary during most of my directorship of CREATE, and  
25 then I passed the baton to Isaac Maya as interim

1 director on 1st of January, to move to IIASA, and here  
2 he is shortly after he got the job with new Secretary  
3 Napolitano. So CREATE actually survived or went through  
4 three secretaries, which is quite remarkable by itself.  
5 And we are going to recompetition at the end of the  
6 year, and with some luck and some skill I hope my  
7 colleagues will manage to win the recompetition. So the  
8 theme of CREATE was risk and economic analysis and why  
9 is this an important theme for research. Here's a quote  
10 by Secretary Chertoff. We have to identify and  
11 prioritize risk, understanding the threat, the  
12 vulnerability and the consequences, and then we have to  
13 apply our resources in a cost-effective manner. I used  
14 to have a very complicated mission for CREATE, and these  
15 days I say the mission for CREATE was and is to help the  
16 Department of Homeland Security do this job better by  
17 providing the science, the research, the risk  
18 assessments, the economic assessments to do this task.  
19 CREATE is an interdisciplinary center. We have quite a  
20 few social scientists, lots of economists. I'm not an  
21 economist, so I was surprised how many different types  
22 of economics there are. If you put five economists in a  
23 room, you get about ten different opinions, I  
24 understand. We have political scientists, international  
25 relations folks and so on. We have a good component of

1 engineering, and I'm actually pleased that operations  
2 research, which is primarily an engineering discipline,  
3 is on the list of topics for the recompetition, and  
4 computer scientists, public policy, decision science and  
5 so on. Here is a list of our current partners, and  
6 CREATE officially is a national center. We call it the  
7 National Center for Risk and Economic Analysis of  
8 Terrorism Events, but we also have four international  
9 partners. We have a very important partner in Australia  
10 at Monash University. Peter Dixon, who is one of the  
11 foremost economic modelers of major interruptions and  
12 changes using computer role generalized equilibrium  
13 models. We have a partner at the London School of  
14 Economics, a partner in Israel. This was one of the  
15 projects that we bid on through the international venue  
16 of science and technology and one of the first ones that  
17 they founded. And here we're dealing with our skills in  
18 risk and Technion's risk in Israel with liquid  
19 explosives, and we're studying how can we detect liquid  
20 explosives and how can we manage the flow of liquid  
21 explosives better. And then IIASA is of course my new  
22 institution, and I managed to snip off a small piece  
23 just to keep my interest in terrorism, and this is a  
24 subcontract from FEMA. This is not coming out of S&T  
25 but from FEMA on emergency preparedness.

1 IIASA itself does not do terrorism research or security  
2 research partly because it is such a wide far-flung  
3 international institution. I was not trying to  
4 introduce that at this stage of the game into the  
5 topics. The main research topics at IIASA are, in the  
6 new strategic plan that we just passed, energy and  
7 climate change, food and water scarcity, and poverty.  
8 So global problems and how to tackle those. CREATE  
9 is -- coming back to CREATE, our research framework at  
10 CREATE was a focus on risk assessment, economic  
11 assessment and risk management. Risk assessment is  
12 essentially determining in a quantitative way the  
13 threat, the vulnerability and the consequence of  
14 terrorist attacks. Economic assessment looks at the  
15 direct economic impacts in terms of business  
16 interruption, losses to structures, losses to lives.  
17 But, most importantly -- and this is where I think  
18 CREATE has developed its skill -- indirect economic  
19 impacts due to behavioral changes in consumption  
20 patterns, demand patterns, et cetera, and often that we  
21 find, as you'll see in a minute, the indirect impacts  
22 often overshadow the direct ones. Risk management deals  
23 with the questions, well, now that we know what the  
24 problem is, what can we do about it? And that's  
25 actually often a liberating step that I will mention at

1 the end. We do a lot of risk management work.  
2 In August of 2006 the science and technology division  
3 was reorganized, and these are the three -- the  
4 directorate was reorganized, and these six divisions  
5 were created, and we were asked to align with one of the  
6 divisions. And I really tried. I tried very hard, and  
7 I reluctantly came to the conclusion that we're really  
8 serving all the divisions and proposed, and this was  
9 eventually accepted, that we ought to be able to support  
10 all six divisions of the Department of Homeland Security  
11 Science and Technology Directorate in risk assessment,  
12 economic assessment and in risk management. And we do  
13 and we did, and if you look at our projects they  
14 splatter through this whole table. And we have at any  
15 given time about 30 projects, and they're all over the  
16 place.

17 The kinds of models that we build in risk assessment are  
18 based on probabilistic risk analysis, game theory,  
19 economic assessment, impact models, also economic  
20 analysis of terrorist behavior, and then resilience is  
21 an important topic. And in risk management we have some  
22 advance tools of defender/attacker decision trees, game  
23 theoretic models for inspection and controls -- I'll  
24 talk about that in a minute. The three that I bolded  
25 here I will chat about in a little bit more detail.

1 First let me talk about risk analysis. There is about  
2 30 years of experience in risk analysis, so this was  
3 nothing new when 9/11 occurred, but many people like  
4 myself, many researchers in risk analysis, thought that  
5 terrorism is different in many ways but also similar in  
6 many ways to other risks in the world. So we look back  
7 at the sort of analyses that were done in nuclear power  
8 plant risk, environmental risk, natural disasters. We  
9 also see of course the bridge between natural disasters  
10 and terrorism in organizations like FEMA which are part  
11 of DHS, and that was kind of a natural transition.  
12 There were many attempts to apply risk analysis to  
13 terrorism. Our focus is primarily on probabilistic risk  
14 analysis. I'll talk about that in a minute. We also  
15 have a game theory team at CREATE and so on. The  
16 hardest part of risk analysis is threat analysis. We  
17 mentioned earlier threat vulnerability consequences is  
18 triplet. Threat analysis is the most difficult one, and  
19 initially I shied away on doing threat analysis because  
20 I thought it was too complex and I wanted to get my  
21 footing first with the CREATE team in terms of  
22 vulnerability analysis and consequence analysis. Turns  
23 out that consequence analysis is very well covered by  
24 the national laboratory, so we went out of that  
25 business. We'll just buy it from them when we need it.

1 And they give it to us, quite frankly. Vulnerability  
2 analysis with (unintelligible) tools. And then I think  
3 it was sometime in, oh, I think it was 2006 or so, maybe  
4 early 2007 that I saw a report that was issued by  
5 Senator Lugar, and he had asked about 90 people, 80  
6 people for probabilities of terrorist events occurring.  
7 And my first reading of the report I was very critical  
8 of it, but here are some of the results so just to give  
9 you some thought. The question was, what is the  
10 probability of a major nuclear, biological, chemical or  
11 radiological attack in the next five or 10 years in the  
12 world. It wasn't in the United States. It was in the  
13 world. But it wasn't quite clear what "major" meant and  
14 so on. It's one of the big issues with these analyses.  
15 If you're not clear about the question, the answer can't  
16 be all that precise either. So there are some issues  
17 with this.

18 So, for example, the median response, the 50 percent  
19 above/50 percent below response for nuclear attack was  
20 ten percent in the next five years. Seems outrageously  
21 high to me. I really worry about this. So I have some  
22 issues about this, and the next question I asked myself  
23 was, who are these people who gave these answers? And  
24 here are some of them. You probably recognize almost  
25 everybody on this list. But one time I gave this talk

1 at the Rand Corporation a few years ago, and somebody  
2 raised their hand right then and said, these are not the  
3 right people to ask. And I would agree with that. I  
4 think these are people who probably do not know at this  
5 time or even in 2007 when they were out of their  
6 respective jobs what terrorists wanted, what terrorists  
7 could do. And so I returned question to my Rand  
8 colleague and said, who should we ask? And he said,  
9 well, you should ask the terrorists, and that's of  
10 course a little bit difficult. But you can do the next  
11 best, and the next best is two types of people, actually  
12 three types of people. You can ask the intelligence  
13 analysts, and that's what we ended up doing. We went to  
14 the intelligence community to ask these sort of  
15 questions. Much better questions, but these sorts of  
16 questions. You can ask social scientists who study  
17 terrorists and radicalism and so on like in the START  
18 Center that we have or you can ask journalists. For  
19 example, what's the CNN journalist? He actually came to  
20 our meetings a couple of times. The guy who interviewed  
21 Osama bin Laden. You can ask them and -- yeah, exactly.  
22 Peter Berg. So we ended up trying to get a better  
23 handle at threat by asking intelligence analysts, and I  
24 was kind of emboldened because I thought we can  
25 certainly do better than the Lugar study. And we

1 started off a few years ago with looking at the threat  
2 of bioterrorism, and we used a very structured process  
3 called expert elicitation to estimate the threat or the  
4 relative likelihood of use of 28 agents. We had in the  
5 experimental phase only four bioterrorism experts, and  
6 we developed a protocol to do this. Here's sort of a  
7 typical result. This is very hypothetical. The only  
8 thing that's real about it is the shaded areas. These  
9 are the top 20 I think agents, and the numbers on the  
10 right column are the relative probabilities that this  
11 one expert gave to this agent being used in a terrorist  
12 act in the next ten years. And the shaded ones are  
13 anthrax, botulism, Ricin and Yersinia pestis. Turns out  
14 that any way you ask this question, many experts you  
15 ask, the shaded ones tend to flow to the top. This is  
16 no secret. There are reasons why this occurs, and I'm  
17 not going to go into that. So I developed a sense that  
18 there's some stability there so I felt a little bit more  
19 comfortable. And we concluded that ranking and rough  
20 relative judgments of threats are possible. Few  
21 biological agents flow to the top and so on. And this  
22 type of procedure was then later used with some of our  
23 help in 2006 for the biennial presidential report on  
24 bioterrorism and also again in 2008. And it was  
25 attempted in the DHS-wide Risk Based Resource

1 Allocations, as we call RABOT, and then I left and I had  
2 some issues with RABOT also, and this is something that  
3 is still under discussion.

4 Let me very briefly talk about the second leg of CREATE,  
5 the economic assessment. We have about 15 economists.  
6 One of our mainstays is very simplistic or very simple  
7 input-output models. These are very standard models.  
8 The nice thing about them is they're off the shelf and  
9 you can run them very quickly. It doesn't take a lot of  
10 effort. But we have also more advanced models,  
11 computable generalized equilibrium models and developed  
12 behavioral models. And we have one innovation at CREATE  
13 which is the economic modeling impact forum where we  
14 bring different modelers together to do the assessment  
15 of the economic consequences on the same topic. So we  
16 did the last one on 9/11 and there's a new one that  
17 occurs this year. You might think that the economic  
18 consequences of 9/11 are well understood. Trust me,  
19 they're not. There are still arguments about what  
20 exactly they are, although I think our last economic  
21 impact forum did pin that down as I will show in a  
22 second.

23 Here's some of our -- we did about 20 of these kinds of  
24 studies. Indirect economic impacts, for example, of a  
25 dirty bomb attack on Los Angeles and Long Beach due to

1 the port shut down is about 34 billion for 120 days. As  
2 it continues, it's approximately 10, 20 billion a month  
3 until the system has restabilized by having ships sent  
4 to other ports, which by the way does turn out to be  
5 difficult because L.A./Long Beach have about 40 percent  
6 of all container goods in the United States.

7 The MANPADS study was a study of the economic  
8 consequences of a MANPADS attack, surface to air missile  
9 attack on a commercial airplane. There the consequences  
10 come primarily from the reduced passenger volume, and we  
11 used as a benchmark the reduced passenger volume of 9/11  
12 as a comparison. And the input-output model came up  
13 with a result which was quite staggering to me, about 2  
14 hundred billion to 420 billion in indirect economic  
15 losses. Now, if you think about this, this is primarily  
16 through the ripple effects of tourism industry to the  
17 hotels, to travel and so on. Anything that's connected  
18 with travel is affected. So this number, by the way, in  
19 the economic impact forum was down-revised to about 150  
20 based on a number of discussions that the folks had.

21 We're now down probably somewhere between 100 to 150 in  
22 indirect economic impacts of 9/11, so we've pretty much  
23 narrowed this down. The first time we reached a  
24 trillion dollar area, 2 trillion, 2 and a half trillion  
25 or 1.24 trillion -- these are the first two rows -- was

1 when we looked at a complete border shutdown due to  
2 pandemic flu attack, either terrorist induced or  
3 natural. And somebody apparently had the idea -- I'm  
4 glad that I don't know who had the idea, but somebody  
5 had the idea that the solution to a pandemic would be to  
6 shut down the borders of the United States to people  
7 coming in, to people going out, to goods coming in or to  
8 goods coming out, except oil from the Middle East and  
9 electricity from Canada. Otherwise we would just  
10 completely fall apart. And there was an initial study  
11 that said this is not a big deal, and when we heard this  
12 we just thought we couldn't believe it. So we did a  
13 study, and our input-output model showed that it was  
14 well over 2 trillion and certainly 30, 40 million in  
15 this analysis of unemployed. And then a second study  
16 showed this was 1.4 trillion and 22,000 -- 22 million  
17 unemployed. These two numbers were two different  
18 models, one input-output model which doesn't make any  
19 adjustments to prices and changes and the other one an  
20 equilibrium model which does. Typically equilibrium  
21 models are about half the impact because they take into  
22 account more changes of prices, price signals and  
23 consumer behavior. And down at the bottom we see also  
24 the September 11 attack. We estimated about  
25 \$108 million GDP loss. That's kind of a pretty stable

1 number now, between 10,150. And the last element I want  
2 to briefly touch about -- I know I'm running out of time  
3 here -- is risk management. And there I wanted to give  
4 you just one example how science can turn into  
5 technology and technology can turn into rapid runaway  
6 application. And this was an idea that a Ph.D. student  
7 had to randomize security measures and patrols,  
8 randomize them to make them unpredictable, but to do  
9 smart randomization and mainly based on the value of the  
10 targets that you want to protect. It's a mathematical  
11 algorithm behind it. It was implemented in a technology  
12 called Armor, which is a computer program. This  
13 computer program works together with the researchers who  
14 developed it and police officers at Los Angeles Airport  
15 to generate the randomized schedules. There is some  
16 interaction process that can be done. There's a  
17 template that the police officers use. They can put it  
18 into their weekly schedule. They can make adjustments  
19 if they want to, but my understanding is they never did.  
20 They just accept the randomized schedule, and then the  
21 bottom line is basically it becomes very unpredictable  
22 how you conduct your inspections and patrols. Newsweek  
23 picked this up. This is September 28, 2007. "The  
24 elements of surprise. To help combat the terrorism  
25 threat, officials at the Los Angeles International

1 Airport are introducing a bold new idea into their  
2 arsenal: Random placement of security checkpoints. Can  
3 game theory keep us safe?" This is one small example of  
4 how you can get from rather esoteric science -- this was  
5 based on a game that I didn't even know called the  
6 Stackelberg game to something that is implemented. TSA  
7 is using it now to schedule their air marshals. There  
8 are other users of it already. We've got about five or  
9 six users of this type of tool.

10 So, in conclusion, I'd like to make a couple of comments  
11 in looking back on the CREATE work and reflecting a  
12 little bit on it, now having been away for eight months.  
13 I think looking backwards by far the toughest job is  
14 still the risk assessment job. In particular in the  
15 threat assessment part, because adversaries seek  
16 vulnerabilities and high impact, and they're looking for  
17 the surprises, and the surprises by definition are not  
18 something that we expect. And, moreover, probabilities  
19 of threats and attacks shift with our defensive action,  
20 and that's a very big problem. Once you secure one  
21 building or one aircraft, then terrorists will move to a  
22 different path. Economic impacts are critical. The  
23 indirect economic impacts often overshadow direct ones.  
24 9/11, 50 billion direct, 100 to 150 billion indirect.  
25 Shut down the port, the direct impacts are very little,

1 just contamination and possibly some health effects; but  
2 the indirects are enormous.

3 Also public responses are often the vehicle to large  
4 indirect consequences. Like not flying, for example.  
5 Risk management focus can help, and here I feel very  
6 strongly that when you focus on what can be done you can  
7 make some progress. If you just keep on worrying about  
8 the problem, there won't be any progress. So  
9 identifying options, identifying decisions and  
10 implementing the good ones is important. There can be  
11 also what some people call paralysis by analysis. We  
12 analyze, we do research, but often I tell my scientists,  
13 my researchers, my analysts, don't try to optimize this  
14 problem to the Nth degree. Just make sure that you  
15 identify the real losers and get rid of them. Often  
16 it's as important to identify those options that are not  
17 good as it is to identify the real good ones because if  
18 you have eliminated the real bad ones, you're probably  
19 going to be relatively safe with the remaining choice.  
20 And, as usual, it's not up to the decision theorists,  
21 the analysts and the researchers, but often to politics  
22 what the ultimate choice is. So thank you very much.

23 This was a bit of a tour de force. In all of these  
24 projects we had international help. LSE helped us with  
25 the economic analysis. We're working closely with IIASA

1 on threat. And we have been working with Australia on  
2 the economics. The way this works is we're identifying  
3 all partners in the international arena, come to us,  
4 develop projects, and it can be funded through CREATE.  
5 So thanks very much. It was a pleasure to be here. And  
6 happy to answer questions, but I also don't want to  
7 steal the time from Starnes Walker.