Dr. Tony Tether, Director
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DARPATech 2002 Welcoming Speech

Ladies and Gentlemen. It is my pleasure to welcome you to the 22nd DARPA "State of the Union Address." From its original conception in the mid-70s, DARPATech has evolved into a signature event.

During my job interview process last year, I was told to make DARPA like it used to be—an entrepreneurial hotbed with high-risk, high-payoff programs with program managers who were always getting the director in trouble. I was also told that space was important and that DARPA was to come up with innovative ideas to provide more robust capabilities in space.

We have tried hard over the past year to do this. The jury is still out whether we are succeeding, but these charges are the prime movers behind what has been done.

During this symposium, you will have the opportunity to hear from our offices about DARPA's technology portfolio. You will have the opportunity to meet directly with our program managers.

What I would like to do is focus on how DARPA does business and provide some insight into our decision processes. Most people know what DARPA does, but not how we actually do it.

I hesitate to show this slide because most people instantly think that DARPA has an organization. Nothing could be further from the truth. We don't have an organization. We're roughly 140 PMs bound by a common travel agent.

It is a program manager-centric organization. What we do is aggregate PMs that have like interests into what we call offices. What we found is that when you put people together with like interests, they start to like each other, and they might even start to trust each other. When that happens, you get a nonlinear generation of ideas that you wouldn't get before. And that is what DARPA is all about—the generation and execution of new ideas.

When I became Director, I said that the PMs are the heart and soul of this place. The rest, including myself, revolve around them. You can imagine the impact on the office directors!

Some asked, but all thought: "Then what do we do?"

I cannot really describe how important the office directors are to DARPA. They are the folks that carry the vision. They are magnets. They are the ones that people come to DARPA to work with and they are really very, very important.

Another fact about DARPA that is overlooked is that the PMs are here for only 4 years. DARPA is not a place for a long-term career. We don't hire people for jobs at DARPA. There are no jobs. We hire people for their ideas. PMs come into the agency with an idea. We squeeze it out of them, drain them, then throw them out, and get another one. And after 4 years, they look like this!

I thought that there was nothing more appropriate than having a DARPATech at DisneyLand. DisneyLand is a land of dreams and fantasy becoming reality, and that is what DARPA does and does well. We have had a lot of fun creating this symposium. Part of the fun was each office finding a DisneyLand-like theme for what it does.

Note that there is one new theme that did not appear on the earlier non-org chart, space.

Since space was of interest to PMs all over DARPA, instead of creating a single focus area, we created a virtual office run by several of the current office and deputy office directors. You will hear more about this later.

One question often asked is "How does DARPA fit into the overall science and technology (S&T) process?"

Please do not take too literally the timelines near, mid and far. They are just supposed to indicate how long the idea has before it is an acquisition program. Service S&T tends to pile up on the near- to mid-term. Now, it's great S&T, but it is normally oriented toward things that we know about: systems that already exist. It is oriented toward providing solutions to current day problems.

Why is this true? As the Service S&T programs make their way up the food chain, they are prioritized by the various SPOs. The SPOs naturally rank high those efforts that will solve problems they know about. Hence, anything that does not directly attack a current effort tends to be at the bottom of the list.

On the other hand, there are people on what I call the far side. You all know who these people are. I am sure you have met them and you might even be one of them. These are the folks who say that if you take this system and that system and put them together, you could really have an improved capability. They are the people who say that you can manipulate atoms until you get a brand new material with fantastic strength properties. Unfortunately, these folks never seem to get funded since there is no advocate for a multisystems approach. They almost have to be like an electron and tunnel through from the farside to the nearside.

When technological surprise occurs, the only people usually surprised are way over on the near side. There is always someone on the far side who says something like "Hey, if you wanted a satellite, I knew how to do it. All you had to do was give me the money, etc."

Now the reason DARPA was created, and what DARPA does extremely well, is to fill that gap. We go and mine the far side. We find people with great ideas that don't have any other way of getting their projects funded; give them a pot full of money and accelerate that idea to the near side, as fast as possible. Sometimes, without DARPA, it probably would never have occurred.

At this point you should all be thinking, "Hey, great process, great vision, but has DARPA ever really done anything worthwhile? Has DARPA been able to fill that gap?"

This slide illustrates some of the things DARPA has done. As you know, DARPA was born of the space age. The launch of Sputnik also launched DARPA, so our initial projects were all space. However, DARPA almost ceased to exist around 1960, when space was taken out of DARPA. NASA and the National Reconnaissance Office (NRO) were both created out of DARPA. This was a sad day for DARPA. I was told by General Betts, the second DARPA director, that the PMs and management were disheartened.

By the way, this seems to be one of the few perks being a DARPA Director. They all seem to live a long time. I think we have lost only one.

But a new mission came along, one whose purpose was to counter a brand new threat that no current service or agency was tackling, ICBMs. From around 1960 to 1970, DARPA drove the advancements in ballistic missile defense until, once again, that mission was taken out and the Army Ballistic Missile Defense Agency (ABMDA) was created.

We also did the M-16 rifle. Some of you may say that perhaps we should not count that one, but it did turn out to be a good rifle.

We got into stealth in the early 1970s and did it for aircraft, for ships such as the Sea Shadow, and for ground vehicles. Today, you can take a ride on the Sea Shadow in San Diego.

You all know about Global Hawk and Predator. What you may not know is that we began working on Global Hawk in the 70s as the Teal Rain program. Afghanistan made Predator famous, but it also began in the early 80s as Teal Amber. This slide shows only the big items that DARPA has provided. However, there are many other technologies and embedded subsystems that are actually the heart, soul, and brains of

larger systems that were developed and made available by DARPA. I would like Mr. Aldridge or Dr. Sega to create a DoD regulation that states that any DoD system (hardware, software) that had DARPA technology associated with it, would require a sticker saying, "DARPA inside." If I could do that, I'm sure that every DoD system would have to have that sticker. I also believe that 50 percent of all commercial systems, especially electronics and communications, would have to have that sticker as well.

DARPA is sometimes said to have ADHD (Attention Deficit Hyperactivity Disorder). That is true and possibly one of our greatest strengths. As you listen to the DARPA people this week, I am sure you will agree about the hyperactivity. On the other hand, we do start developments and then seemingly get distracted and go off and do something else. We'll start a project, work on it for a while, and if it doesn't work out, we'll stop it. The reasons for stopping sometimes stem from discovering that the underlying assumptions on existing technology were not valid.

So we wait. Time goes on. A new PM, office director, or even a new DARPA director will come in and we'll start that effort again.

There is no sin for failing at DARPA. Why? Because no one remembers the failure. That allows us to try again and again without the baggage usually carried at an organization where people are there for careers.

DARPA is Ground Hog Day. We do things over and over and over again. And eventually get them right. You wouldn't have Global Hawk and Predator today if we hadn't started work on it 20 years ago. We probably had four tries on the technology before getting what we have today. Stealth, precision weapons, autonomous systems—all have been and are still being developed. Even the Internet would not exist.

One of the many questions I am asked is "How does DARPA transition technology?" We transition technology in three ways.

The largest percentage transitions when we develop a technology capability in industry and industry gets brave enough to bid the technology to somebody other than DARPA. When does this happen? When industry can not only manufacture the capability, but also figure out how much it will cost and know how long it will take to build. There is always a CFO who wants to know the answer to these questions. Even here, industry won't bid if they feel the Service customer will not accept it.

Our second major transition method attacks the Service buy-in issue and is also shown on the slide. DARPA deliberately executes well over 80 percent of its budget through the Services. DARPA PMs are not allowed to be contracting officer technical representatives (COTRs). We try to always have a Service person fill the COTR role. Why? Because the Service COTR eventually becomes the Service advocate for the technology and is the person who will keep it going after the PM's departure from DARPA. This is an important transition path.

Thirdly, we occasionally build prototypes. These are the DARPA activities most well known and are the ones that people usually point to when they say we never transition anything.

There are major problems transitioning prototypes. Even when everybody wants it, usually no one planned for it and put it into the POM. Here you have a 2-year POM cycle problem. Nobody wanted to commit future dollars for it until they knew it would be successful. Then we get into a contest as to who will pay the bridge money. We try to avoid this issue by having MOAs with the Services that indicate the outyear dollars that are to be available assuming the technology is successful and passes negotiated entrance criteria.

I want to make another comment about DARPA's structure that relates to transitioning technology. We have technology offices with people who like taking concepts to components. Then we have system offices with people who take those components and integrate them with other technology into prototype systems. Not necessarily big airplanes, but perhaps a sensor package. And we have a few offices that do both.

We have found over the years that having this deliberate mix is essential to pushing along technology-based developments. It allows us to not depend on the Services to take the technology to the next step, but allows it to happen internally and keep moving up the food chain.

Another question often asked is "How does one do business with DARPA?" In order to know how to do business with DARPA, you need to know how programs get started.

Sometimes a program is initiated because of an obvious military requirement, but more often than not a program gets started because of the determination of the PM. This chart shows the impediments we put in place just to see how serious the PM really is.

A "hair on fire" type of person will find a way to convince us to make an investment. A PM can get an idea from industry, academia, or government laboratories, or he can already have an idea that needs to be proven feasible. In any event, the PM first tries to convince his office director of the project's worthiness. If that happens, the PM will get some modest funding that we call a "seedling." If the seedling effort looks promising, the PM can pitch the results as the basis for a new program. If approved, a Broad Agency Announcement (BAA) can be issued, with contractor selection and milestone definition occurring in about 90 days.

On the other hand, all PMs can come directly to the DARPA director with an idea. This is deliberately done to allow ideas to flow that might not be of interest to the PM's office director or, in fact, any DARPA office director.

One bit of advice for those of you wanting to do business with DARPA. Recall that I said that we rotate PMs at the rate of 25 percent turnover a year. The PMs you want to know are the new ones. These are the ones with ideas that have not been turned into contracts.   In order to make it easier for you all to know who is new, our website and phone directory every month indicates new additions to the agency. Go see these folks.

I have told you about the past, but now lets turn to the future.

Every DARPA director had a slide like this one. This slide has eight items that state my promise that these are the capabilities DARPA will provide for the funding it is receiving today. Many, if not most, of these capabilities will not occur while I am DARPA director. Some future DARPA director will take full credit for them. That's ok, because I am taking full credit, when I want to, for capabilities available now that I did not start.

Let me comment on only a few of these, as you will be getting a lot more detail in later presentations.

Detecting and defeating terrorist networks is a capability we are going to develop. DARPA was in the counterterrorism business starting in the mid-1990s. When 9-11 occurred, we already had technology efforts that were directed at the transnational threat, as we called the terrorist threat at that time.

Link discovery and evidence extraction is one example. Dispersed groups have to communicate somehow if they are planning an attack. Not necessarily by talking, but maybe financial and other transactions. We believe we can put together the technology to discover who is in that network.

We also have a behavioral analysis program. We did pretty well on being able to predict what a terrorist group was going to do based on open source literature. Unfortunately, it was a different terrorist group than the one that hit us on 9-11.

After 9-11, we decided to create an office that had these technology efforts, but also had a prototype thrust to build a system that would detect, classify, and provide options to preempt terrorist activities before they occurred. The Information Awareness Office (IAO) is now building such an end-to-end prototype, and you will hear more about that in their session.

On the other hand, If we cannot preempt or deter, being able to detect, track and destroy mobile surface targets such as SCUDs is a difficult task. We are building technology that will replace the current paradigm of the J-2 Intelligence Staff finding the target and the J-3 Operational Staff killing the target. That structure was built for mostly fixed targets. Moving targets are a different story.

With what we've seen regarding Predator and Hellfire in Afghanistan, we believe we can develop the technology that can take those two organizations and make them into one. This is the reason that another new office, the Information Exploitation Office (IXO), was created.

Another major capability is developing robust networks. It may seem obvious, but a lot of people tend to forget that in a network-centric force, if you do not have the network, you do not have the force.

As I mentioned earlier, another charge from the Secretary was to develop more robust space capabilities. DARPA is focusing on a number of innovative technologies and approaches in this area. You will hear a lot more on this area later this week.

When I say bio revolution, I really mean just that. I have reviewed over the past year hundreds of projects, both ongoing and proposed. However, there is one project that has struck me the most. DARPA has a monkey at Duke University, where probes were implanted into its brain. The unique factor of these probes is that they were not rejected. They have been in the monkey for over a year now without any harmful effect.
The monkey was given a joystick and taught that to receive a treat, the monkey had to move the joystick. The signals from the implant were transmitted to a mechanical arm also grasping a joystick. The mechanical arm was taught to move in the same manner as the monkey's arm. So, when the light came on, the monkey moved the joystick in order to get the treat. The signals were then sent over the Internet, of course, to MIT where the mechanical arm was located and the mechanical arm moved its joystick.

Now that is terrific, but that is not the chilling part. We took the joystick away from the monkey at Duke. The light came on. Who knows what the monkey really thought, but it knew what it had to do. But it had no joystick. However, the mechanical arm at MIT moved the joystick just like it did before. It was thought at first that the motor signal was being transmitted to MIT, but it turned out that the probes had tapped into the monkey's thoughts for moving the joystick. In other words, the monkey thought about moving the joystick, and the joystick at MIT moved.

This has tremendous possibilities. I don't know how long this is going to take, perhaps 25 years or more. But it will happen. The genie is out of the bottle on this possibility, and the nation that first gains this capability will dominate.

Imagine 25 years from now where old guys like me put on a pair of glasses or a helmet and open our eyes. Somewhere there will be a robot that will open its eyes and we will be able to see what the robot sees. We will be able to remotely look down on a cave and think to ourselves, "Let's go down there and kick some butt." And the robots will respond, controlled by our thoughts. It's coming. Imagine a warrior—with the intellect of a human and the immortality of a machine—controlled by our thoughts.

DARPA has started a major program in this area. DARPA is the only place you can have such a program, and talk about it! This is a great time to be in R&D.

I personally know that Vice President Cheney, Secretary Rumsfeld, and Secretary Aldridge all believe that a well-run business plows back on the order of 3 percent into R&D for the next new product. In addition, they believe that while Service S&T is valuable, DARPA should receive on the order of 0.8 percent of that topline or 25 to 30 percent of the total S&T. They want someone to be looking for those ideas on the farside that, when brought to the nearside, will revolutionize the way we do business.

So, come and join us. Either as a contractor or even as a PM. If you have an idea that you can't get done where you are, come see us and perhaps we will be able to transform that fantasy into reality.

Will all the technology fantasies you will hear about for the rest of the week become reality? It's impossible to predict right now. But if we pursue these technologies, develop them successfully, and get them into the hands of our future warfighters, the U.S. military commander in the field years from today will value them highly.

Who are these future warfighters? Do we know them? You bet we do; they are our children.

The theme of DARPATech 2002 is "Transforming Fantasy." Our fantasies today will be their reality in the future. And that's the most motivating factor of all.

Thank you all.   Enjoy the symposium, and don't forget to visit the exhibits..