

Testimony of Ms. Heidi Jacobus, Chairman and CEO of Cybernet Systems Corporation on the merits of and deficiencies in the current SBIR program as applied to the Department of Defense

Chairman Shuster, Ranking Member Larsen, thank you for the opportunity to address the Defense Business Panel this afternoon.

## **Introduction**

I want to tell you about my 20 years of experience since starting a high-technology federal contracting business from scratch. The highly competitive, merit-based SBIR program made Cybernet possible, and without it I am confident my company would not have been able to exist.

I told the story of the founding of Cybernet 13 years ago in a Senate hearing on the second before last reauthorization of SBIR (Congressional Record attached).

Then, as now, SBIR was a successful small-business program. Its reauthorization was uncontroversial. The current SBIR Reauthorization (in its 12<sup>th</sup> CR) has been fraught with fractiousness over many issues including who is eligible to compete for an SBIR, and who qualifies as a small-business owner and operator. I believe that the proposed changes are drastic departures from a 30 year proven program, and will not be for the good of the Soldier, Sailor, Airman or Marine.

## **H.R. 1425 damages SBIR competition based on Merit.**

One of the most egregious changes the House Small Business committee proffered in H.R. 1425 is Section 505 which dilutes merit-based selection because the most meritorious companies will be restricted in participating. Does this mean that an item might end up in the field with second rate technology? Should proven good small business not apply?

## **Prior House Small Business Committee and the Science Committee testimony DOES NOT represent the over 50% of SBIR awardees that receive Defense Contracts.**

The House Small Business Committee and the Science Committee have jurisdiction over the entire SBIR program, but consider that fully half; more than \$1 Billion of SBIR funds are expended in the Department of Defense. During the past few years there have been cognizant committee hearings on SBIR in the House. An examination of witness lists from these will show that the vast majority of those giving testimony have been taken from Biotechnological firms, Universities, Large (Billion dollar plus) venture capital firms, and Medical Patient

Testimony of Ms. Heidi Jacobus, Chairman and CEO of Cybernet Systems Corporation on the merits of and deficiencies in the current SBIR program as applied to the Department of Defense

or Disease Advocacy groups. All of these principally compete for the non-DOD half of SBIR – i.e., the Science and Health agencies.

Cybernet has received many federal contracts as shown on my Witness Disclosure Form. Although we have worked for many agencies, Cybernet's work is mostly for the Department of Defense, all selected after rigorous nationwide competitions. Besides the federal contracts, we have been granted more than 35 U.S. Patents for our innovations.

I make a strong distinction between federal contracts (as used in the DOD process) and federal grants (as used by the Science and Health agencies). This panel's Witness Disclosure Form makes the same differentiation that separates federal contracts from federal grants. Cybernet does not apply for "grants," all of our DOD work is won by submitting openly competed proposals for contracts to meet defined needs. I use the term 'open' in this context because by design, SBIR competition is open to all small businesses of from 1 person to 500 people in size.

**“Full and Open” means “Do not apply” to Small Businesses – Large businesses have a systemic advantage.**

I did not use the term “full and open competition.” At the dawn of SBIR, its authors recognized while nearly half of the nation's scientists and engineers were employed by small businesses of less than 500 people, small businesses received federal funding for research and development in the low single digits percent. This meant that a significant amount of U.S. scientists and engineers were not contributing to federally funded research to meet soldier's needs.

Some have argued that the allocation of SBIR funds to 1-500 person sized small businesses ought not exist, that 'if the company is good enough it can compete for R&D contracts.' I can give the panel many examples from my business's attempts to win contracts in David and Goliath settings. Practically speaking, small businesses such as ours did not and still do not have a high likelihood of winning “full and open competitions” against the likes of BAE, Boeing, and Lockheed Martin, the top 3 defense contractors that combined had nearly a trillion dollars in revenue in 2008. Without SBIR, nearly one half of the nation's technically competitive technical staff will not be allowed to bring their knowhow directly to the DOD. They will only be allowed to compete with service firms like travel

Testimony of Ms. Heidi Jacobus, Chairman and CEO of Cybernet Systems Corporation on the merits of and deficiencies in the current SBIR program as applied to the Department of Defense

agencies, janitorial services, and temp agencies for what is still an insignificant dollar amount small business contracting through the large Prime contractors.

Sometimes a small valued, but seminal R&D topic RFP is announced as a “full and open competition.” A small business, such as Cybernet, might well have the technical staff on hand and want to get a foot-hold in the domain. We have been in many such competitions. The large companies that desire the forward looking work can apply massive internal research and development funds (IR&D or “IRAD”), which are for the most part also re-purposed federally funds (allocated to the Prime by overhead allowable funds that come with their large programs work like the F-22 or the Ground Combat Vehicle). Furthermore, they have marketing people everywhere and inevitably know more inside information about each project that we can easily know from openly published information sources. Even in the case of a small “starter” contract of several hundred thousand dollars, a larger prime can apply “loss-leader” funds and “special knowledge pertaining to the bid” to its bid and proposal (B&P) funded effort. The result is the smaller businesses won’t win, even when they are lower in cost and may have a technical edge.

I saw such an example of loss-leading bidding years ago. Before “Photoshop” made color pictures easy and inexpensive; we had used our best technical and “artistic” efforts to create a plain black and white paper proposal. The RFP topic was technically very appealing, the future contract’s dollar amount low. We had several Ph.D. engineers capable and eager to utilize their knowledge. The winning system was unveiled with a screening of a “Hollywood” style movie-clip, filmed with realistic actors, equipment and scenery depicting the proposed work. The production price was likely more than our annual revenue at that time.

A cost accounting pool for Bid and Proposal (B&P) is part of most government contractors’ structure, and another cost pool called IR&D or IRAD (Internal Research and Development) is available and can be used freely. As a negotiated percentage, large companies’ billions of dollars of base acquisition business naturally produces a huge IR&D resource for them. As I understand it, what is done with that IR&D pool is not required to be delivered as part of a contract – effectively the Government provides pure investment money without strings to Primes. Potential uses of IR&D goes toward pre-designing future products, or

Testimony of Ms. Heidi Jacobus, Chairman and CEO of Cybernet Systems Corporation on the merits of and deficiencies in the current SBIR program as applied to the Department of Defense

towards polishing a rough products, or perhaps to subsidize key technology development proposal bids or to creating a lavishly produced proposal.

A small business's base for its own IR&D is of course small. It is unreasonable to expect it could support pre-designs of future products, polishing rough products, or substantially subsidizing the bidding process. The irony in the example I saw, the government likely had reimbursed that large company to produce the Hollywood production values movie about 'soldiers fording the stream' – and the actual products proposed already existed in the Government's fount of SBIR results. But the Prime did not use that technology base because it did not own it and by bidding it again, could re-create and own it. *My sense is that such well funded public relations efforts like the mocked up movie are quite appealing to selection committees and enhance the perception that the proposed product is ready to field when it usually is not.*

**There is no practical SBIR Phase III transition program – Congressional funding with DOD user support used to be one way to fill the gap, but is now out of favor.**

Product readiness for the military is defined by several criteria, including Technology Readiness Levels or TRL's. Roughly, TRL Levels 1-4 lead to initial prototypes, Levels 5-7 to Test and Evaluation (i.e. field ruggedness, salt-water resistant, drop testing and compatibility) while Levels 8-10 lead to the Fielding.

SBIR is funded by a small percentage allocation of an agency's existing "extra mural" R&D funds. This allocation funds Phases I and II of SBIR. A typical DOD SBIR Phase I and II would be about \$800 – \$900k and last of about 3 years. This level of effort results in a TRL Level 4 or 5, or a pre-production product. With the prototype in hand the product's potential value can be seen, but the required testing and integration into the military's materiel typically has not and could not have been done on this budget.

Typically, additional funding is required in order to field the product after the end of Phase II. In the past decade, it is not unusual to have had non-SBIR sourced "Phase III" funding come from congressional sources. It has made sense where the SBIR reached the prototype stage and where the DOD customer could assert, when asked, that the technology was an unfunded requirement and desired.

Testimony of Ms. Heidi Jacobus, Chairman and CEO of Cybernet Systems Corporation on the merits of and deficiencies in the current SBIR program as applied to the Department of Defense

Congressional funding filled the minimum 5-year gap from pre-production demonstration to inclusion into the regular budget, or the POM. This is how robots that have to make IEDs inert were initially funded. This is how Cybernet's automated ammunition reclamation units that process the returned small arms ammunition in Kuwait and from military training ranges were purchased before they reached the POM.

The current freeze on such congressional funding has left DOD and SBIR companies in a lurch with no organized transition funding path. The gap or chasm between R&D and readiness for the military field is well recognized, and there is no identified funding process to meet those needs. Small businesses do not have large enough IR&D funds to self-fund, and DOD products can be unusual enough that traditional outside investors hesitate to invest. There is the potential that thousands of innovative problem solutions will remain on the shelf even though SBIR has paid for them. By the way, this is problem for all of the R&D elements that support the DOD including University research groups, small businesses, and the National and Service funded laboratories. The DOD transition successes for strong small business have been in spite of a standard funding process.

This gap has been recognized and a few programs to address the lack of transition funding process have been put in place. Several agencies have what is called CPP (Commercialization Pilot Programs). CPP programs are addressing the right problem, but with subcritical resources that are more focused on creating commercial business success that meeting the soldier's urgent needs. A new program, just off the ground is the DOD's RIF, Rapid Innovation Fund. It is divided into 4 parts: OSD and the 3 major agencies. The current funding released will support approximately only 6 SBIR Phase III projects in each agency. The RIF is also open to all comers, so thousands of proposals will likely be received for each opportunity and we will have to see if its processes and funding levels meet the transition need. We are concerned that focus of RIF kept on transitioning innovation projects and not to see the funds diverted elsewhere.

**SBIR projects are “shovel ready” and stimulate both technical and non-technical jobs immediately when funded. These jobs have to be in the U.S. and they tend to be rooted in their communities.**

Testimony of Ms. Heidi Jacobus, Chairman and CEO of Cybernet Systems Corporation on the merits of and deficiencies in the current SBIR program as applied to the Department of Defense

We only fund just a small fraction of the efforts that are qualified for funding (the typical SBIR win rate at Phase I is only about 10%, Phase IIs 25%, and potential Phase III extensions through all transition programs are small enough that each is an “SBIR Success Story”). If you really want a “shovel-ready” stimulus for the high tech industry, fund more of these unfunded programs. They directly hire technical and non-technical people at a ratio of about 60% technical to 30% general business and non-technical. The funds will cycle into the economy immediately, and we have plenty of examples of how SBIR technology has revolutionized industries over the last couple of decades (SBIR drove service robotics, computer game and user interface technology, applications of mapping and GPS path planning, rugged computers, materials science, advanced battery technology, and host of other things). The small businesses don’t always get the major market share, but they innovate IN THIS COUNTRY (i.e. only U.S. companies can get SBIR projects).

**There is no effective plan to get SBIR technology into large acquisition programs.**

Small Businesses often complain that they cannot get a “seat at the table” during the planning phase of a major new system. This is not surprising when the program planning is done at such a large scale, and probably happened five years ago (to get into today’s POM). This is not to say that there are not instances where already developed SBIR technologies are used. There are often no effective advocates at the Prime contractors looking to utilize outside small businesses. A corporation’s executives ought to be, and are obligated to, be looking out for the benefit of their own business, not someone else’s business. I think there should be stronger guidance from the DOD customer, the party that writes the checks for SBIR, to push relevant SBIR technologies into programs wherever possible at the earliest stages of a new program so that the DOD gets what it is paying for. Maybe DOD Primes should be directed to put some of their small business contracting goal dollars into funding into the SBIR – this would make them more vested while getting DOD small business small business subcontracting targets up. A related idea is that the subcontracting funds be used proportionately according to the statement of work, so that an advanced shipbuilding projects subcontracts so small businesses in Naval Architecture as well as to hull painters,

**The Defense contracting process is wasteful and capriciously uncertain.**

As a more mature DOD small business we have sometimes had a seat at the table. Then we get a sample of the frustration that all sizes of government contractor have with the broken procurement system. One recent example is that we were asked by Boeing to bid on the Large Caliber Ammunition Resupply (LCAR) system – an automated ordnance magazine in an ISO container that could upload up to 400 shells to the Future Combat Systems (FCS) mobile mortar, tank, or artillery vehicle. We had (from SBIR) the only sensor that could automatically keep track of the kind of shells being uploaded and off-loaded in and out of the LCAR. *Our team, which included commercial automotive automation houses, won the bid on low cost and schedule only to see it evaporate because Boeing lost its FCS Prime contract.*

We worked closely with a Prime contractor on the Ground Combat Vehicle (GCV). The GCV competition was first launched at 11 AM on a Thursday in early 2010 at a AUSA meeting in Fort Lauderdale. I was there. The RFP release had been eagerly anticipated and would be newest major vehicle design for the Army. People left the room to phone in the news and to download the massive RFP. I would estimate that much of the Defense industry diverted significant engineering time and funds bidding that first GCV completion. I know we did. At a public forum in Michigan in the Fall of 2010, a panelist from one of the largest Primes commented that “30% of their engineering time had been spent on bidding GCV.” The comment was made in light of the fact that after intense B&P work for large Primes and for small businesses like ours, the entire RFP was abruptly cancelled. And then it was replaced by a second RFP that was substantially the same as the first. *This delayed the entire process by over 8 months and cost the bidders another big outlay of money (we estimate Primes spent \$30m+ and we ourselves spent more than \$250k – a lot for any small business to bear “on spec”).*

*Irrespective of the reasons, cancelling this first GCV meant that U.S. defense industrial base engineering talent at very large scales had been expended on a project that went nowhere. For the most part it ended up funded by the Government through ultimately reimbursed IR&D (i.e. wasted talent and U.S. Government money).* In the second bid, three teams were expecting an award because that is what the Government procurer had indicated would happen. We

were taken aback when only 2 teams were announced when 3 had been widely anticipated. I remember talking to Dr. Malcolm O’Neill in between the sets of GCV RFPs who was confident that competition decreased ultimate costs by more than 10%. Having only 2 teams lessens the competition and it seems that the two contractors selected were the highest cost ones. With the consolidation so evident in the U.S. defense industry, where 37 large defense firms have collapsed into 5 over the span of 1993-2007, we have far less competition at the large Prime level today than we had less than 20 years ago. We’ve seen U.S. defense suppliers sold to foreign firms. I fear that the DOD, as a customer, will suffer from the declining defense industrial and manufacturing bases. Less competition does not get the most cost effective bids, less competition decreases innovation because a safe strategy is to stay’ within the box’.

It was disheartening that our 2 years of significant efforts teaming on the GCV resulted in no work. Another negative competitive factor was that we had spent so much on the bid that our retrospective Overhead Rate determined with DCAA is now higher, meaning we are rates are less competitive and in turn, our work costs the Government more. Smaller businesses have less capacity to absorb large negative outcomes. We have a smaller “base” of work to spread our risk over. We hear a lot about concern over maintaining the defense supplier base – this is not how to do it.

We have spent significant effort working to obtain larger contracts. There is a rule that a company is down-rated to win a larger contract if the company has had no previous experience of having a larger contracts ( a Catch 22). We saw this when we bid the early “small business set-aside” topics for FCS. We made the competitive range in all cases, went to final oral discussion, but didn’t make that first round. It took three years of knocking to get the LCAR opportunity with Boeing and the Army, just to have it dashed by changes in the Army’s priorities. By the way, the logic of LCAR is that an empty howitzer is not a useful. The current motorized howitzer, Paladin, is done when it has spent 39 rounds (i.e. it is done in about 80 minutes of continuous fire). But when paired with a \$125,000 LCAR robotic unit with 200-400 rounds on board, it can continuously fire. This makes one Paladin equivalent to up to 16 in a continuous engagement. Why did this capability go away with FCS – it saves money and makes the Army artillery more lethal.

**More mature Small Business still need SBIR because they are at a systematic disadvantage and actually benefit from their success less than the U.S. economy as a whole does.**

Sometimes, we are asked why we still need SBIR. A straightforward answer is that even though small businesses innovate and have a big impact on the industrial base, they still don't get all the return on investment from what they accomplish. That is they still need help to keep doing new things. As an example, our company invented the robotic technology that powers force feedback game controls for Xbox, PS2/3 and others. We tried to commercially license it in the late 1990 when the market was young, but were only partially successful. The present day force feedback industry sells well in excess of \$4 billion of product per year (Microsoft is probably in the \$1 billion range alone), but our return from this innovation was about \$16m over 10 years, about half of which we spent on self-funded IR&D for other technology leveraging our DOD work.

For instance, we sponsored our own DARPA Urban Challenge automated vehicle entry without the funding that some of the big universities and Prime contractors got from DARPA. Our car progressed to the last round and would have completed if there had been one or two more days testing time allotted in Victorville, CA. As is it is, we have some very interesting follow-on development work that combines our expertise in ordnance automation with automated driving. We are presently funded by the Army to productize automatically driven material handling equipment to remove personnel from the threat of handling live ammunition pallets. *Virtually all of the vehicle robotic technology available to the DOD is from small businesses that have done SBIRs – but none of these firms can compete on mainline robotics programs without a Prime contractor front under the current system. With few exceptions, we still need SBIR seed money to keep moving the technology forward. Even though we have 50+ robotic engineers (which is as large a group as any of the Primes and even the largest robotic labs in university) we still need new SBIR to continue to innovate.*

**DOD and Government program “success” often does not align with what is defined as success in the venture capital community.**

SBIR Phase III takes a product through the remaining DOD Technology Readiness Levels (TRL) for fielding or to commercial industry products. Depending on the type of product, it might be that some entity or investment group anticipates a large enough financial reward to approach the small business with a proposition to take the group’s investment funds, and thus to “commercialize” the product through venture capital. In business, such an investment rarely occurs without guarantees to the outside investors and subordination of the founder group’s interests to those of these investors. These terms may not necessarily favor all technologies that DOD is interested in pursuing and is at least sometimes counter to DODs interests.

While this might be a normal business model that works in the “commercial” world of big-box stores, medical sales to masses, or to biotech pharmaceutical firms that need tens of millions for clinical trials, the model of receiving outside investment does not work well for a niche technology defense contractor that has to develop a market for his/her product over a 5-10 year time frame (recall that getting into the POM takes at least 5 years from product introduction, 2-3 years after the first SBIR Phase). Our experience with even leading edge commercial technology, like force feedback, is that it take 10 years from concept to viable opportunities to license or sell (force feedback was started in 1988, patented in 1992, and first licensed to Microsoft in 1999).

**DOD Phase III SBIR transitions are too few, and swamped with difficulties.**

Some SBIR Phase III’s are directly funded by DOD customers. We think that this should be more common than it is, because DOD SBIR requirements are set to meet DOD needs and so it should be only natural for success to be defined as meeting those needs. Cybernet has a successful Army Phase III is called “ATACS” Automated Tactical Ammunition Classification System” – informally known as “the ammo sorter” that began like this, from funds at the Defense Ammunition Center. The ATACS ammo sorter has saved the Army tens of millions of dollars over its 6 year life so far. It was not planned. It was a result of serendipity piqued by an urgent need in Kuwait motivated by the pile-up of turned-in ammunition being process by hand by expensive contractor personnel.

Testimony of Ms. Heidi Jacobus, Chairman and CEO of Cybernet Systems Corporation on the merits of and deficiencies in the current SBIR program as applied to the Department of Defense

The ATACS ammo-sorter automates the process, speeds and improves a manual task that had been the standard practice for over 50 years. An urgent need in the field sparked the Commanding General in Camp Arifjan, Kuwait, to ask the question ‘why not automate it’ and ‘has anybody else done it?’ Ammo that had been out in the field that was not used or expended (i.e.” live”) could potentially be reissued to Soldiers, saving a great deal of money.

But doctrine / safety required an intensive hand inspection process. The hand inspection to return “good” ammo to service was entirely manual, the teaching materials dated from the 50’s, it was painstakingly slow, and quite wasteful in the end. The watchword was: “When in doubt, throw it out.”

This process was supervised by the Quality Control professionals (called QASAS) specific to Ammunition from the Defense Ammunition Center (DAC) in McAlester, Oklahoma, part of the Joint Munitions Command (JMC) in Rockville, Illinois.

The Army “found” Cybernet through a listing of an SBIR we were in process of performing for the Picatinny Arsenal in New Jersey. We had already built ordnance identification and inspection “bolt-on” to what would later be the FCS LCAR ordnance identification unit. We fixed digital cameras and lights in that bolt- on frame to read the mortar’s markings and identify them by type (like a “munitions” supermarket barcode scanner).

The Army found us when the engineers at DAC performed a search to see if anyone was already using automation to assist in ammunition sorting and inspection.

**Small Businesses are actually the heart of the American Defense industrial base which has to be preserved and protected.**

It was about 7 years ago we received a phone call that we remember went something like this – “Hello, this is Sergeant .... We have a problem in Kuwait; can you help us fix it?” We were naturally surprised, but as engineers we asked that they describe the problem and send us specifications. We evaluated the problem, looked to our capabilities and to local automobile industry suppliers who

Testimony of Ms. Heidi Jacobus, Chairman and CEO of Cybernet Systems Corporation on the merits of and deficiencies in the current SBIR program as applied to the Department of Defense

make conveyor belts and shaker tables, and cost estimated a plan to complete the project in 6 months. It was accepted and we began.

Then, the need for the item became more urgent, and we were asked to deliver in what would be 90 days after contract. This is also called “90 DAC” in contracting language. This is not a typo. It strains credibility to imagine designing, building, carefully taking apart, boxing and shipping a 6,000 lb custom robotic device to Kuwait, from scratch, in such a short time. *Small agile businesses like ours, with roots in the local economy have the fast reaction capability that the DOD often needs. I know from experience it has taken longer to get a Non-Disclosure Agreements signed at a large company. Even the 4 star General who often spoke about our product told me that he himself received pushback at the notion that it took only 90 days.*

To be clear, it was 90 days and nights and a two week employment process in Kuwait – including software programming on the way there in the airplane. The entire company pitched in. I contacted our current contracting officers and asked for no-cost time extensions on other contracts to free our staff up. I guaranteed a few people hunting season leave next year as an incentive. Engineers brought in futons and saved commuting time. One night (at 2:30 AM) close towards the shipping date I counted 13 people working on it. Clearly it strained us to the limit, but we were motivated, we knew the need was urgent, and we wanted to deliver for the Army customer.

Now, seven years later, the ATACS is still in use in Kuwait – it hit the Army POM two year ago but is still a year-by-year funded item. Additional units are at Fort Irwin at the National Training Center (NTC) in the Mohave Desert. We have had feedback that the machines are able to process the turned in rounds quickly enough after a training rotation that Soldiers who would have had to remain till the turn-in processing was complete are now able to spend more time at home. It’s gratifying to know that.

We’ve also designed a self contained portable unit in an ISO shipping container and have plans to build a smaller “wheeled” transportable unit. A variation that inspects spent-brass to enhance income from the sale of that brass to recycling smelters has been built as well.

This is a very good example of what small businesses can bring to niche military needs. Part of the success of the ATACS was that it was a “stand-alone” activity. It was not an add-on component to a large submarine or helicopter for example so a small firm had a chance this time. Another part of our success is that it a small niche market overlooked by anyone else. Had the market for this invention been millions of units and billions of dollars, I am sure that we would have seen a lot of more competition, fair or otherwise, from large companies. Therefore the project was right-sized for a company like ours.

### **Preserving the industrial base is not just about the Defense industry.**

Our geographic location in the automotive manufacturing area around Detroit allowed us to visit the machine tool shops we used, and to convince the owners (also small businesses) that our order needed prioritization. Our SBIR technology gave us the building blocks to quickly design and build the first-of machine. Note that this is a good example that in time of need, the supply base may very well be small businesses. *The industrial base, supported by the US automotive industry mostly, is still very important to making any kind of new machinery the defense department needs in the future, especially if it is needed rapidly.*

And, it wasn't just the allure of a hunting season time vacation leave, it was that our engineers have the skills to apply to such thorny problems and are good at it and enjoy it. The project leader at Cybernet has been to Kuwait a dozen times and to Afghanistan once. I myself have been to Kuwait three times. You do not often get that motivation from a larger firm environment.

### **We need to engender trust in Defense contracting more than we need adversarial contracting.**

Making the bridge between our technological capabilities and the military's problem is the key. I believe it isn't quite right to ask the customer “What is your requirement?” It is easy to imagine that the customer does not have the technical framework to describe what the requirement is. What if the answer was about computing in the 60's? The requirement known to the current user is ‘I need a better key punch-card machine.’ Those users had never seen a mouse, a trackball or a gesture-interface. The better way is to say “What is your problem?” so we engineers can understand it and apply the best technology to solve it. A good

Testimony of Ms. Heidi Jacobus, Chairman and CEO of Cybernet Systems Corporation on the merits of and deficiencies in the current SBIR program as applied to the Department of Defense

bridge between contractor and the DOD customer is key. Putting contractors in an adversarial or difficult position make for sub optimal results.

Earlier this year I gave a guest speaker at the Army War College at Carlisle Barracks, Pennsylvania. I described my company and our work. I detailed the ATACS with respect to the chapters in HTAR (How the Army Runs.) The class of 300 had just studied the Army's acquisition cycle and knew how complex the process is.

After my talk, I was swamped by compliments about my talk. Many of the Soldiers (most were at the O6 level) told me they had never thought of contractors in a positive way before they heard my talk. Many told me they didn't even know of small contractors like mine. I was glad to have made this talk and am hopeful that the cooperation I discussed between the Army and Cybernet in developing the ATACS becomes more prevalent. We are part of the team and need trust from Congress, the DOD and country to keep doing the right thing.

### **We need more flexible contracting dollars.**

The ATACS technology, based on the SBIR, was too new to have been described in a 5 year old prior POM. In addition, the funds for the manual reclamation task were OMA (Operations and Maintenance Army) dollars and so the way our automation solved the problem with advanced technology could absolutely not be paid for by OMA dollars. Even so the cost benefits were so clear.

After the initial amount of R&D dollars the Army had found in swept-up funds was gone, we were left with no continuation funding. It took congressional interest so that the Army could continue the project over the next few years until it was officially POM'd. Now the device is part of the Army's catalog of standard APE (Ammunition Peculiar Equipment.)

### **We need more trust and collaboration between the agencies and Small business.**

I credit the close collaboration we had with the Defense Ammunition center to the project's success. We needed to absorb the "schoolhouse" knowledge taught by the Army's ammunition Quality inspectors. We could not have travelled to Camp Arifjan, Kuwait, ourselves without our technical monitor from McAlester,

Oklahoma accompanying us. We went through significant paperwork to get permission to go, etc. We had active participation from the end-customer which helped us develop the most useful product for them.

We've had other less effective SBIR Phase I contract experiences. One program I recall we proposed and won against an RFP, which as usual, had only a few paragraphs of description. Soon after award, we wanted to meet with the customer to get more details, but we weren't allowed to have any contact with the technical POC. It turned out that there had been multiple Phase I winners. That agency was a "contractor-run" facility" so the contracting office was staffed with non-federal employee. One had decided that none of the awardees could talk to their shared technical point of contact for fear of unfair cross-talk. It made no sense to us. Surely there are solutions like all meeting together; sharing communications as would be done during question prior to an RFP release, etc. that could have been employed. We each completed our 6 month SBIR Phase I contracts in parallel, in a vacuum, and it is no surprise that no firm's project direction aligned with what the customer needed. What a waste of time and money!

**The DOD has special requirements that drive advanced technology – but not always technology for immediate commercial return.**

I'm often asked why Cybernet does not sell, for example, their computer vision systems resident in the "ammunition sorter" to factories. The answer is that sometimes we do – for instance, we are putting systems into a new polymer case ammunition manufacturing system derived from ATACS – But the military requirements are generally far more stringent than the "commercial" world's. Mixed lot identification of cylindrical objects in the field is more difficult than the computer vision recognition requirements for normal single production item in-process inspection. The factory machine's job is easier, it usually is single purposed, and it goes to the lowest bidder. If it makes bolts it does not pump out bolts and screws and sometimes thrown-in hand-made pieces of metal. Bolts come out of the bolt machine. We know the expected dimensions and specifications a priori. Our military solution is overkill and overcosted for a simple commercial setting.

The ATACS robotic inspection system we built for the Army in Kuwait is essentially over-kill for normal industrial customers. Consider putting any industrial automation system in a place where fine talcum powder consistency sand dust permeates everything, the temperature varied between 46 °F and 120 °F many days, and power goes up and down. The military has very specific needs and we as defense contractors strive to meet them.

We have built our business on niche, innovative, advanced military technologies and the occasional commercial spin-out license. Our group has many advanced degrees, with Ph.D.s and many Masters Degrees in a variety of topics - Computer Science, Electrical Engineering, Mathematics, Mechanical Engineering, Nuclear Engineering, and Physics and so on. Our company is defined as small, about 50 people total. When I founded the company, the largest of defense contractors were far smaller than they are now, and communication and potential collaboration easier. I remember visiting Martin-Marietta in Denver before it became part of Lockheed Martin. There have been mergers of Northrop and Grumman, Boeing and McDonnell Douglas, etc. Consolidation of Defense Prime contractors impacts small businesses across the board. We compete against so much larger competitors than we did 10 years ago, and those large Primes possess so much more horizontal technology & marketing capabilities that they need not look outside their walls without a push.

## **Conclusion**

As a whole, the services do not have a good method or mechanism to transitioning innovative products to the military. DOD has successful Phase I and II programs creating TRL level 4 and 5 products, and then we companies are on our own. We can't sell the product at that stage. We can't find mainstream funding because our products are too new to have reached the POM and the option for congressional interest funding has vanished. The SBIR product still needs ruggedization, testing, evaluations, and certifications. The new RIF will transition only a small number of efforts. There needs to be a mechanism, a process to bridge the gap to insert SBIR technology into programs of record. Small business is an unrecognized, but vital part of the defense supply base and SBIR is ALL that keeps it available to the DOD. Keep SBIR, Keep SBIR strong. We ARE, as they say, 'shovel ready.'

**OVERSIGHT OF THE  
SMALL BUSINESS INNOVATIVE  
RESEARCH (SBIR) PROGRAM**

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**HEARING**  
BEFORE THE  
COMMITTEE ON SMALL BUSINESS  
UNITED STATES SENATE  
ONE HUNDRED FIFTH CONGRESS

SECOND SESSION

—  
JUNE 4, 1998



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Senator ENZI [presiding]. Thank you, Mr. Busch. Ms. Jacobus.

**STATEMENT OF HEIDI N. JACOBUS, CHIEF EXECUTIVE OFFICER, CYBERNET SYSTEMS CORPORATION, ANN ARBOR, MICHIGAN**

Ms. JACOBUS. Good morning, Mr. Chairman and members of the Committee. Thank you for the opportunity to speak to you.

My name is Heidi Jacobus. I am the founder and the chief executive officer of Cybernet Systems in Ann Arbor, Michigan. Cybernet is a small business that uses high technology to amplify human performance, for example, with virtual reality training systems, robotics, and networked computer systems.

The SBIR program provided me the opportunity to take my Ph.D. thesis topic in computer science, to submit it, and to have it funded. The company started from one SBIR contract. I am confident Cybernet would not exist without this program. To have my proposal well received gave me the courage to quit my job, begin this business, which has over the past 10 years grown to over 50 professionals who have completed many successful contracts.

My family had no background in business. My immigrant mother could not speak English when I was born. In fact, neither of my parents finished high school. Both worked, sometimes two jobs, in factories. But they valued education. My education resulted from scholarships, work study, and my parents' sacrifice.

After grad school I married. My husband and I both worked at Texas Instruments and started our family. When the children started school, I needed something to do. I started volunteer work. But I wanted to do something more.

So I took a part-time job at the University of Michigan and I became aware of the SBIR program. I submitted a proposal based on my planned Ph.D. thesis topic. I can still remember the day I got a phone call from an ARPA Air Force Ph.D. colonel who called my proposal "the best he had ever read." I was thrilled. I was energized. And Cybernet began in my daughter's bedroom, after I moved her in with her younger brother.

The company thrived. The first year we grew from 1 person to 3 and then to 10. Cybernet now provides 60 people with good jobs. We deliver innovative results at hourly rates that are one-third to one-half the total price of larger firms.

We have many repeat customers. Our people are some of the best in their fields. The company has 5 U.S. Patents issued and more than 15 pending.

SBIR helped shape Cybernet as a company. While large companies can execute large projects, small firms like Cybernet often act as midwives between university research and larger companies. SBIR really helps support that role.

There are many resources, both State and national, to help small businesses. Individuals help, too. I was lucky to get Mr. Billy Jefferson as my first contracting officer at NASA. He did a terrific job guiding me as we worked through Cybernet's first NASA contract.

SBIR encourages people like Billy Jefferson to get the best technical value for his agency. However, no two small businesses are alike and we cannot apply a cookie cutter solution to business development, capitalization, or marketing.

SBIR is a vital source of innovation funding to industry. We produce prototypes at lower costs. We make ideas real.

Cybernet produced its first robots in 1990 based on NASA's space station requirements. We produced the foundation for future consumer products. It took until 1997 for there to be major product offerings in this area. Now many companies are building products. This means SBIR sparked a whole new technology.

For another project, we built a series of command and control units for ARPA under Colonel Erik Mettala, Ph.D. from the Army, now retired. He asked Cybernet to design the product so that it could be funded through two Phase IIs. One was from the Army TACOM and one was from ARPA. The benefit is one SBIR can be used as leverage for another.

Based on this, we have developed a software product called NetMAX. We will introduce NetMAX later this month at the International Unix User's Conference in New Orleans. Without SBIR this, and other valuable products, could not have been funded in Michigan using venture capital or bank loans.

Cybernet would not have been able to grow without the opportunity from SBIR. We strongly support this program and would like it to continue.

Every company has its own story. Thank you, Senators, for the opportunity to tell ours.

Senator ENZI. Thank you very much for your testimony. It is always exciting to be at the small business panels where we hear from entrepreneurs that had the courage to take advantage of some of the Federal programs that are available and improve on them a little bit and put them into effect. So we are pleased to have all of you on this panel.

Mr. Busch, I am particularly pleased that you are on this panel and I appreciate the work that you do in Wyoming. When I was in the legislature, I was one of the people that did the original funding on EPSCoR which, of course, is the Experimental Program to Stimulate Competitive Research and it is kind of a tool that you use in your work.

I know that there are a lot of things in the program that are very beneficial but what we are trying to do is find out what kinds of changes would help the program, particularly from the aspect of those of us that have States that are under-represented in the grant process, and I know that is what you are trying to overcome. Could you give us some suggestions on things that we could be doing?

Mr. BUSCH. First of all, I think all of the small businesses that I associate with want the SBIR program to remain highly competitive. I think what the small businesses and the rural States want is access to the competition or a shot at the competition. That is what they really want.

I think, as I mentioned in my testimony, that outreach efforts are beneficial toward that end. States that have conducted outreach efforts for a number of years have clear dividends as a result of it. Kansas comes to mind, as an example. They have a very dramatic curve that Rich Bendis shows, showing the increase in the number of awards since they have initiated their SBIR outreach activities.

**DISCLOSURE FORM FOR WITNESSES  
CONCERNING FEDERAL CONTRACT AND GRANT INFORMATION**

**INSTRUCTION TO WITNESSES:** Rule 11, clause 2(g)(4), of the Rules of the U.S. House of Representatives for the 112<sup>th</sup> Congress requires nongovernmental witnesses appearing before House committees to include in their written statements a curriculum vitae and a disclosure of the amount and source of any federal contracts or grants (including subcontracts and subgrants) received during the current and two previous fiscal years either by the witness or by an entity represented by the witness. This form is intended to assist witnesses appearing before the House Armed Services Committee in complying with the House rule.

**Witness name:** Heidi N. Jacobus

**Capacity in which appearing:** (check one)

Individual

Representative

**If appearing in a representative capacity, name of the company, association or other entity being represented:** Cybernet Systems Corporation, Founder & CEO

**FISCAL YEAR 2011 CONTRACTS**

<b>federal grant(s) / contracts</b>	<b>federal agency</b>	<b>dollar value</b>	<b>subject(s) of contract or grant</b>
W15QKN-11-C-0019	Army	\$ 69,950	Closed Loop Fire Control (Ballistics Simulation)
N00164-06-C-6002-0011	Navy	\$ 1,994,188	Sustainment Wireless Maintenance Asst. SWMA
W9113M-11-C-0028	Army	\$ 69,910	Cyber-Security USB Firewall
N00167-11-P-0183	Navy	\$ 149,919	Long Distance Remote Maintenance Capability
N00014-11-M-0234	Navy	\$ 149,838	Low Power UUVs (Unmanned Underwater Vehicles)
W900KK-11-C-0021	Army	\$ 99,963	Non Line of Sight (NLOS) Weapon Orientation
NNX11CB59C	NASA	\$ 599,623	Automated NDE (Non Destructive Evaluation) Flaw Mapping System
W81XWH-10-C-0164	Army	\$ 749,856	MedOne Interconnect for OneSAF (Simulation)
W81XWH-11-C-0109	Army	\$ 149,920	Kinect(Gesture Recognition) Soldier Virtual Interface

**FISCAL YEAR 2011 CONTRACTS, continued**

W912DY-07-D-0008-0008	Army	\$ 628,646	ATACS (Ammunition Sorter)- Task Order 0008
W912DY-07-D-0008-0009	Army	\$ 184,842	ATACS (Ammunition Sorter) - Task Order 0009
NBCHC090042	DHS	\$ 99,998	Cybersecurity Hard Drive Unlocking
FA9201-09-C-0147	Air Force	\$ 99,891	Disposable Sensors for Directed Energy Test & Evaluation
W91RUS-09-C-0034	Army	\$ 711,512	Radio Simulation

**FISCAL YEAR 2011 SUB- CONTRACTS**

STM1213705	Alion/ Army	\$ 2,000,000	Automated Forklift
PCS-F2234-CSC-01	SeaLand- Aire/ Navy	\$ 15,000	Compact Rivervine AUV (Autonomous Unmanned Vehicle)
PO 110203	Veraxx/ Navy	\$ 86,271	Information Assurance for CH- 53E CFTD
PO-11-0263CO1	Saab/ Army	\$ 75,000	Information Assurance for LT2- IRS (SAAB Training)
PO 110601	Veraxx/ Navy	\$ 19,069	Information Assurance for MV- 22 CFTD #1

**FISCAL YEAR 2010 CONTRACTS**

<b>federal grant(s) / contracts</b>	<b>federal agency</b>	<b>dollar value</b>	<b>subject(s) of contract or grant</b>
N00024-10-C-4120	Navy	\$ 593,809	Automated System Test and Repair Tool
FA8650-10-M-1776	Air Force	\$ 99,979	Autonomic Knowledge Representation
NNX10CE66P	NASA	\$ 99,953	Automated NDE Flaw Mapping System
NNX10CE36P	NASA	\$ 99,900	Automated Autonomy Assessment System
W912DY-07-D-0008-0010	Army	\$ 419,878	ATACS (Ammunition Sorter) Task Order 0010
NNX10CA16C	NASA	\$ 598,688	Small Satellite Analysis Laboratory
FA8750-10-C-0113	Air Force	\$ 99,547	Automatic Artificial Diversity for Virtual Machines
FA8750-10-C-0059	Air Force	\$ 99,739	Cybersecurity Secure Browser
FA9302-10-M-0002	Air Force	\$ 99,987	Multispectral Desert Fauna (Surveillance)
W81XWH-10-C-0164	Army	\$ 99,956	MedOne Interconnect for OneSAF Simulation
N68936-10-C-0069	Navy	\$ 79,991	Shearography Motion Correction
N10PC20114	DHS	\$ 749,948	Telecommunications
060803 360384 01	Army	\$ 2,861,071	Virtual Systems Integration Laboratory
NNX10CB01C	NASA	\$ 599,441	Automated Behavior and Cohesion Assessment Tools
NNX10CA94C	NASA	\$ 598,464	Grasp Algorithms For Opto-tactile Robotic Sample Acquisition

**FISCAL YEAR 2010 CONTRACTS, continued**

N68936-10-C-0115	Navy	\$ 69,835	Terminal Guidance for Autonomous Aerial Refueling
N00167-10-F-0090	Navy	\$ 99,889	Sustainment Wireless Maintenance Assistant. SWMA GSA
W912DY-07-D-0008-0011	Army	\$ 880,405	ATACS (Ammunition Sorter) Task Order 0011
N61339-10-C-0045	Navy	\$ 343,616	LCS Information Assurance
W15QKN-10-C-0121	Army	\$ 868,380	Automated Forklift

**FISCAL YEAR 2010 SUB CONTRACTS,**

<b>federal sub contracts</b>	<b>To fed. agency</b>	<b>dollar value</b>	<b>subject(s) of contract or grant</b>
PO 90911	Veraxx/ Navy	\$ 2,879,745	Cybersecurity IA/ADVTE
PO A81760	Cubic/ Army	\$ 24,502	IA/Alaska Training Range Evolution Program (ATREP)
PO A81882	Cubic/ Army	\$ 22,234	Cybersecurity IA/MILES-TVS
PO 100407	Veraxx/ Navy	\$ 63,946	Cybersecurity IA/MV-22
PO 100703	Veraxx/ Navy	\$ 83,004	Cybersecurity IA/CH-53
PO 90911	Veraxx/ Navy	\$ 2,879,745	IA/USMC ADVTE 'ATO' Authority to Operate Currency
A84750	Cubic/ Army	\$ 252,702	Cybersecurity IA/MILES TVS

**FISCAL YEAR 2009 CONTRACTS**

<b>federal grant(s) / contracts</b>	<b>federal agency</b>	<b>dollar value</b>	<b>subject(s) of contract or grant</b>
NBCHC090001	DHS	\$ 99,967	Telecommunications Linking System
NNX09CC45P	NASA	\$ 99,971	Procedure Execution and Projection System
NNX09CD93P	NASA	\$ 99,960	Grasp Algorithms For Optotactile Robotic Sample Acquisition
NNX09CC31P	NASA	\$ 99,956	Small Satellite Analysis Laboratory
NNX09CD79P	NASA	\$ 99,823	High-Speed FPGA Image Decoder
NNX09CE35P	NASA	\$ 99,939	Automated Behavior and Cohesion Assessment Tools
N100167-09-F-0038	Navy	\$ 100,000	SWMA
W900KK-09-D-0411-0001	Army	\$ 2,500	STOC-II Full and Open
W900KK-09-D-0574-0001	Army	\$ 2,500	STOC-II Small Business Set Aside
N61339-09-C-0022	Navy	\$ 749,882	High Res HMD
W91RUS-09-C-0024	Army	\$ 49,688	Radio Simulation
W912DY-07-D-0008-0008	Army	\$ 628,646	ATACS - Task Order 0008
W912DY-07-D-0008-0009	Army	\$ 184,842	ATACS - Task Order 0009
NBCHC090042	DHS	\$ 99,998	Hard Drive Unlocking
FA9201-09-C-0147	Air Force	\$ 99,891	Disposable Sensors for Directed Energy Test & Evaluation
W91RUS-09-C-0034	Army	\$ 711,512	Radio Simulation

**Federal Contract Information:** If you or the entity you represent before the Committee on Armed Services has contracts (including subcontracts) with the federal government, please provide the following information:

Number of contracts (including subcontracts) with the federal government:

Current fiscal year (2011): \_\_\_\_\_ **14** \_\_\_\_\_ ;

Fiscal year 2010: \_\_\_\_\_ **27** \_\_\_\_\_ ;

Fiscal year 2009: \_\_\_\_\_ **17** \_\_\_\_\_ .

Federal agencies with which federal contracts are held:

Current fiscal year (2011): Army, NASA, Navy \_\_\_\_\_ ;

Fiscal year 2010: Air Force, Army, DHS, NASA, Navy \_\_\_\_\_ ;

Fiscal year 2009: Air Force, Army, DHS, NASA, Navy \_\_\_\_\_ .

List of subjects of federal contract(s) (for example, ship construction, aircraft parts manufacturing, software design, force structure consultant, architecture & engineering services, etc.):

Current fiscal year (2011): Software, Modeling & Simulation, Image Analysis, Small Caliber Ammunition Sorter, Cybersecurity Hardware, Non-Destructive Evaluation (NDE), Unmanned Underwater Vehicles R&D, Information Assurance, Hardware, Robotics, R&D

Fiscal year 2010: Software, Modeling and Simulation, Image Analysis, Robotics, Information Assurance, Cybersecurity, Telecommunication Data Mining, Automated Forklift, Small-Caliber Ammunition Sorter (ATACS) , Information Assurance (IA), Hardware, R&D

Fiscal year 2009: Software, Modeling & Simulation, Image Analysis, Small-Caliber Ammunition Sorter (ATACS), Sensor Design, Cybersecurity, R&D, Robotics

Aggregate dollar value of federal contracts held:

Current fiscal year (2011): \_\_\_\_\_ **6,228,507** \_\_\_\_\_ ;

Fiscal year 2010: \_\_\_\_\_ **15,668,354** \_\_\_\_\_ ;

Fiscal year 2009: \_\_\_\_\_ **3,229,075** \_\_\_\_\_ .

**Federal Grant Information:** If you or the entity you represent before the Committee on Armed Services has grants (including subgrants) with the federal government, please provide the following information:

Number of grants (including subgrants) with the federal government:

Current fiscal year (2011): None ;  
Fiscal year 2010: None ;  
Fiscal year 2009: None .

Federal agencies with which federal grants are held:

Current fiscal year (2011): \_\_\_\_\_ ;  
Fiscal year 2010: \_\_\_\_\_ ;  
Fiscal year 2009: \_\_\_\_\_ .

List of subjects of federal grants(s) (for example, materials research, sociological study, software design, etc.):

Current fiscal year (2011): \_\_\_\_\_ ;  
Fiscal year 2010: \_\_\_\_\_ ;  
Fiscal year 2009: \_\_\_\_\_ .

Aggregate dollar value of federal grants held:

Current fiscal year (2011): \_\_\_\_\_ ;  
Fiscal year 2010: \_\_\_\_\_ ;  
Fiscal year 2009: \_\_\_\_\_ .

## **HEIDI N. JACOBUS**

### **CHAIRMAN AND CEO**

M.S. (Computer Science — Human-Computer Interaction) University of Illinois, Urbana  
B.S. (Psychology) Trinity College, Hartford, Connecticut



Heidi N. Jacobus has more than 20 years of experience with interactive computer systems. Before founding Cybernet Systems, she held an appointment at the University of Michigan's Center for Ergonomics, which was funded under a Chrysler Technology Access Fund contract to study graphical displays used in Computer-Aided workplace Design (CAD) systems. She was also a member of the technical staff at Texas Instruments, Inc., where she developed man-machine interfaces for naive users and developed interactive teaching systems. At the University of Illinois, she investigated the use of color displays for fault-diagnosis applications. While at the University of Illinois, Ms. Jacobus received an award for "Excellence in Undergraduate Teaching." Prior to that, she worked to develop interactive PLATO teaching systems that introduced beginning FORTRAN programming and operated the Computer Aided Instruction facility at the University of Connecticut Health Center.

Ms. Jacobus was elected to the Board of Directors of the National Center for Manufacturing Sciences (NCMS). She also served on the board of the Robots in Hazardous Environments (RHE). She is one of 20 charter members of the National Employers Leadership Council (NELC), which provides industrial perspective and support to the Secretaries of Labor and Education on work-force issues for future jobs. She also serves on the board of the Small Business Technology Coalition.

Ms. Jacobus has had the honor of election to the Cosmos Club (Washington, D.C.) and was recognized by Crain's Detroit Business as one of the most influential women in Michigan. She was also a recipient of the prestigious "2003 Top Michigan Women in Computing" award, which honors women who play leadership roles in Michigan, demonstrate significant accomplishments in their careers, and act as a positive role model for women.