Testimony of

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On behalf of

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and

The National Small Business Association
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SBTC is the nation’s largest association of small, technology-based companies in diverse fields, and represents more companies that are active in the federal Small Business Innovation Research (SBIR) Program than any other organization. SBTC is proud to serve as the technology council of the National Small Business Association.

Founded in 1937, the National Small Business Association (NSBA) is the nation’s oldest nonprofit advocacy organization for small business, serving more than 150,000 small companies throughout the United States.
This hearing comes at a critical time. For more than a decade, other nations have been chipping away at the U.S.’ global leadership in technological innovation. Now a second powerful threat is upon us – the worst recession since the Great Depression.

To help restore our economy and strengthen our place in the world, we must encourage the growth of technology and innovation. As I hope to show in my testimony, small business generally, and the SBIR Program specifically, offer extremely efficient ways to meet the challenges we face. Of course, SBIR alone cannot do all that is needed. Programs such as the Department of Commerce’s Advanced Technology Program (ATP) and the Technology Innovation Program (TIP) of the National Institute of Standards and Technology should be expanded, and new efforts to encourage and commercialize innovation should be explored. Likewise, we need to promote early-stage investments in technologies, like those provided by “angel” investors. We should also provide assistance for small businesses in filing foreign patents.

Three key important trends the Committee should be aware of:

1. **25% OF KEY INNOVATIONS COME FROM SBIR**
   Small business is also delivering the key innovations. Just the SBIR Program – with 2½% of extramural R&D at eleven federal agencies – has been delivering about 25% of the nation’s most important innovations every year for the past decade, according to a recent study by the Information Technology and Innovation Foundation. Large companies, which had been delivering about 40% of these top innovations when SBIR started in 1982, now account for less than 5% of them (and universities around 8%).

   But federal R&D procurement does not reflect this reality. Still, just 4.3% of R&D goes to small business, and SBIR is over half of that. The small business share of federal R&D has gone up by less than 2% in the last 30 years. If not for SBIR, the figure would actually have declined.

2. **38% OF ENGINEERS WORK FOR SMALL BUSINESS**
   SBIR Program was set up at the time when small businesses employed about 6% of the nation’s scientists and engineers. Now there are over six times as many scientists and engineers choosing small business – 38% altogether. More scientists and engineers work for small companies than for any other sector – large companies, universities, nonprofits, or government.

3. **SMALL BUSINESS CREATES THE JOBS**
   Small businesses are the most effective instrument for helping the nation climb out of recessions and often are the only source of new employment in the years immediately following the start of a recession.

Two conclusions flow from this.

(a) The overall design of the SBIR Program should not be changed. It’s working. As the recent series of NAS and GAO studies concluded, SBIR is sound in design and effective in practice. The SBIR program has worked so well that large wealthier companies and even non-profits are trying to join small business in the SBIR program

(b) The share of federal R&D going to small business should increase, and SBIR is the single best way to do it. The federal government addresses public needs. There is no reason to starve these needs of the nation’s largest pool of science and engineering talent, and its demonstrably best source of innovations.
SBIR Innovation Quality

Is the quality of SBIR innovation output matched by its quantity? Are these innovations really groundbreaking and economically significant? From the perspective of the federal government, for whom the SBIR research is performed, the quality would appear to be quite high. The U.S. Government Accountability Office has studied the SBIR Program on at least ten occasions since the program began, and offered positive assessments in each case.¹ So have several earlier reports by the National Academy of Sciences and the National Academy of Engineering.²

One indication of the importance of a patent is the number of times that it is cited in other patent applications. A study of companies that were “serial innovators” (with 15 or more patents over five years), found that over one-third were small companies; many of them SBIR companies. Patents from these small “serial innovators” were cited 28% more often by other inventors, were twice as likely to be among the top 1% of the most widely cited patents, and were twice as closely linked to scientific research than were the patents from the large “serial innovators”.³

Where Do Key Innovations Come From?

![Bar chart showing the comparison between Total Fortune 500 and SBIR Firms over the years 1971 to 2006.](image-url)

Figure 1: Analysis of NIH Success Rates and Competitive Rates for R01 and SBIR Phase I programs for the years 1998 to 2008. Data provided by NIH: [NIH Databases](http://report.nih.gov/nihdatabase/Charts/SlideGen.aspx?chartId=115&catId=13), the NIH Data Book, from NIH Research Portfolio Online Tool (RePORT) [NIH Website](http://report.nih.gov/index.aspx)

From a different perspective, the Information Technology and Innovation Foundation recently analyzed the annual lists of the 100 most technologically-important innovations, as selected each year by a panel of judges for R&D Magazine.⁴ In the chart above (Figure 1), the authors compared the performance of innovations from SBIR companies on these annual assessments, with those from Fortune 500 companies. The chart indicates, for the past decade, about one-fourth of the most important technological innovations in the nation have been coming from the SBIR Program. Or, as the authors themselves put it:
The results show that these SBIR-nurtured firms consistently account for a quarter of all R&D 100 award winners in the US—a powerful indication that the SBIR Program has become a key force in the innovation economy of the United States.\textsuperscript{5}

It perhaps bears repeating that this is surely a unique level of economic performance for such a relatively small federal program.

**Comparison of NIH Success Rates and Competitive Rates for R01 and SBIR Phase I Programs for the Years 1998 to 2008:**

The SBIR program has been more competitive than the R01 program except for 2008 (even in 2008 the SBIR program was more competitive than the R01 program for six of the eleven years reported). See Figure 2. The reason that only the SBIR Phase I data was used in this analysis is that by Congressional definition of the SBIR program, only the very small Phase I program (average NIH size in 2008 = $174,000) is a fully competitive program and is comparable to the competitive R01 program (average NIH size in 2008 = $395,000). By Congressional definition, the larger Phase II SBIR awards (average NIH size in 2008 = $560,000) are selected only from the most successful Phase I projects (typically 40% to 50% of the Phase I projects transition to a Phase II project for all agencies, including NIH). This ensures that only the most successful SBIR programs transition to additional funding. SBIR is even more competitive when you consider that R01s only go through one level of competition. SBIR Phase II go through two levels of competition and peer review.

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<th>Year</th>
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<td>R01 Competitive Ratio</td>
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**Most Competitive Program**

| SBIR | SBIR | SBIR | SBIR | SBIR | SBIR | SBIR | SBIR | SBIR | Same | R01 |


NIH uses: Success Rate = Percent of Number of Awards divided by Number of Applications = \[
\frac{\text{Awards}}{\text{Applications}}
\]

Standard industry analysis is: Competitive Rate is the inverse of NIH’s measurement, therefore:
SCIENCE AND ENGINEERING EMPLOYMENT

One reason why small business seems to be getting better and better at technological innovation is that it employs more and more scientists and engineers. The trend over the past generation is shown in Figure 3.

Percent of U.S. Scientists and Engineers Employed by Companies with Fewer than 500 Employees

![Figure 3: NSF Science and Engineering Indicators 1993, 2005](image.png)

Strikingly, there are now more scientists and engineers working in smaller companies (38%) than in any other sector. Some 27% of U.S. scientists and engineers currently work for large companies, 16% for universities, 13% for government, and 6% for nonprofits.

The SBIR Program, which may be at least partly responsible for small business’ growing science and engineering firepower, has deployed it to remarkable effect.
Small Business and Jobs

Total Net New Jobs Created in the Sixteen Years from 1989 to 2005 by Company Size at Beginning of Year

![Bar chart showing the number of net new jobs created by company size from 1989 to 2005. Small companies (<500 employees) created 92.7% of net new jobs in the 16 years from 1989 to 2005.]

Figure 4: U.S. Bureau of Census and the Office of Advocacy, U.S. Small Business Administration

For the past 40 years, small companies have created 60-80% of all net new jobs, on average.8 In other words, add up all the new jobs created, subtract the jobs lost when businesses close their doors, and you find that, year in and year out, small business supplies our country with two-thirds to three-quarters of all the new jobs. This tempo may even be increasing. Figure 4 shows that small businesses (with less than 500 employees) created 93 percent of the net new jobs in the U.S. during the period 1989 to 2005.8

Moreover, this pattern of large business job loss persists until well after the country has ended its recession by statistical measures. In 1992, large companies continued to shed jobs. In 2002-3, they shed more than a million of them. Small businesses offset all of these large business job losses in 1992 and again in 2002-4. For these years, small business created 124% of all net new jobs, by offsetting the 25% loss in large business employment.10

In other words, if recent history is any guide, we can look to small businesses to do most of the hiring in this recession for now and the foreseeable future.

This strongly suggests that supporting small businesses in stimulus legislation is likely to have the maximum short-term and medium-term payoffs on Main Street, and more broadly, on the population as a whole. The population as a whole seems to grasp this. According to a recent Zogby Poll, 63% of the public believes that “small business and entrepreneurs will lead the U.S. to a better future” while only 21% believe that “large corporations and business leaders” will do so.11

There are obviously many worthy objectives to be supported in the economic stimulus legislation. It’s unfortunate however, that much of the legislation seems to have overlooked this major point of economic leverage.
**Why?**

The metrics suggesting both the value and the profusion of SBIR innovations raise a very important question: Why? Why would a modest program produce such outsized results?

The National Academy of Sciences team studying the SBIR Program wondered about that, too.

Part of the answer, the NAS says, can be found in the scrupulously meritocratic design of the SBIR Program. SBIR is founded on competition, peer review, and the milestones of Phase I, Phase II and Phase III that are gated by rigorous demonstrations of scientific validity and commercial potential. A paper prepared by the founder of the SBIR Program, Roland Tibbetts that explains why the program was created the way it was and why some proposed changes would be detrimental to the SBIR Program is available at [www.sbtc.org](http://www.sbtc.org).

NAS, NAE, GAO studies’ findings paint a remarkably positive portrait of the Program. The studies and even the summaries are extremely rich and detailed, and worth careful consideration. SBTC’s own précis of the research, which we hope and believe, is a fair overview of the studies, follows:

**The SBIR program is sound in concept and effective in practice.**

The SBIR is an efficient program that is successfully achieving important public objectives.

**SBIR’s results meet the key Congressional objectives for the Program.**

1. **STIMULATING TECHNICAL INNOVATION**
   The NRC study found that, by a wide variety of metrics, the program is contributing to the nation’s stock of new scientific and technical knowledge.

2. **USING SMALL BUSINESS TO MEET FEDERAL RESEARCH AND DEVELOPMENT NEEDS**
   The NAS study found that the SBIR program objectives are aligned with, and contribute significantly to, fulfilling the mission of each of the studied agencies. This is also true across a wide variety of metrics. The inherent flexibility of the SBIR Program makes it especially valuable to agencies with widely-varying missions.

3. **INCREASING PRIVATE SECTOR COMMERCIALIZATION OF INNOVATIONS**
   SBIR is successfully commercializing innovations. Commercial success includes sales, license revenues, R&D investment, research contracts and the sale of equity. The average sales per Phase II project were $2.4 million and the average investment for Phase II was $1.5 million. Given the inherent technical risks involved, “the fact that a high proportion of the projects reach the market place in some form is significant, even impressive.” Between 30 and 50% of Phase II SBIR awards result in commercial success. A record not matched by any other R&D program.

4. **SUPPORTING THE GROWTH OF A DIVERSE ARRAY OF BUSINESSES**
   SBIR provides market access, funding, and recognition to a wide array of businesses, including those owned by women and minorities.

**Conclusions**

The program is achieving its goals of successfully increasing innovation, encouraging participation by small companies in federal R&D, providing support for small firms owned by minorities and women, and resolving research questions for mission agencies in a cost-effective manner.
**SBTC Recommendations for the Reauthorization of the SBIR and STTR Programs**

Congress could take no action with a better promise of stimulating the U.S. economy over the short, medium, and long term than to reauthorize and strengthen the SBIR Program.

**SBTC specifically recommends that Congress:**

1. **MAKE THE PROGRAMS PERMANENT**

SBIR has just been given a strong endorsement by one of the most extensive studies of any federal program ever undertaken by the National Academy of Sciences. This follows three previous studies by the NAS and the National Academy of Engineering that positively evaluated SBIR, as well as ten favorable GAO studies.

SBIR is now the largest single source of patents in the United States, accounting for 40% more patents annually than all U.S. universities combined. It is also the source of a quarter of the most important technological innovations in the United States each year. It is generating, directly or indirectly, billions of dollars in wealth, far outstripping its cost.

It has stimulated the creation of thousands of successful companies, provided the nation with a host of vital defense, homeland security, and life sciences technologies, resulted in billions of dollars in economic activity, and created tens of thousands of high-paying jobs.

If this is not a successful and cost-effective federal program, one may reasonably ask what is.

SBIR should not have to re-justify its existence every three or four years. Delays in Congressional approval of reauthorization that were totally unrelated to SBIR caused the Program to temporarily shut down in 2000. Uncertainty about its future, as each reauthorization looms, puts thousands of jobs, and hundreds of companies, in jeopardy. SBIR has proved its worth. Congress should make it a permanent program, conduct normal cycles of Congressional oversight and management hearings, and make occasional adjustments as needed to the Program’s legal framework.

2. **INCREASE THE ALLOCATION OF R&D DOLLARS GOING INTO THE PROGRAM**

As the foregoing data have shown, SBIR has become a vital contributor to the nation’s technological development and wealth creation. The Program leverages federal R&D resources in uniquely efficient ways. Given the global competitive challenges faced by the United States, SBIR should be given the resources to access America’s untapped innovation resources. SBTC recommends that the SBIR share of federal R&D dollars be gradually increased from today’s 2½% to 5%, at the rate of .5% per year. At a 5% level, smaller companies would still be receiving less than one-sixth of the dollars that their numbers of scientists and engineers, and their patent production, should entitle them to. Today they receive less than one-seventh. A portion of this increase should be allocated to expanding SBIR commercialization programs in the federal agencies, such as the Defense Department’s highly-successful Commercialization Pilot Program (CPP).

3. **TAKE THE STEPS RECOMMENDED BY THE NATIONAL ACADEMY OF SCIENCES TO STRENGTHEN THE PROGRAM**

The NAS studies include several valuable recommendations for strengthening the management of SBIR Programs in the various agencies, and for improving SBIR outreach, among other subjects. The NAS also recommends that SBIR Phase I awards be increased to a limit of $150,000 and the Phase II awards to $1.25 million limit, to adjust for the inflation and cost increases that have occurred since the last such adjustment 14 years ago. At the same time, the Academy correctly notes, Congress must be careful not to extend the dollar limits too high. Companies with promising technologies will be driven out of the Program if fewer firms and fewer innovations absorb more of the available dollars in
each funding cycle. (Multiple awards to single firms in single funding cycles would have a similar effect.) Awards in excess of statutory limits, or multiple awards to a single company during a single award cycle, should be approved in advance on the basis of a written justification and a higher level of review. They should be monitored and compared to the performance of other contract awards. SBTC agrees with the Academy on giving federal agencies ample space to experiment with “Phase IIIB” and similar development efforts.

(4) **MAINTAIN THE INTEGRITY OF SBIR AS A SMALL BUSINESS PROGRAM**

At various times in the past, legislation has been proposed that would allow large firms and Universities, either alone or acting through intermediaries, to have unrestricted access to the SBIR Program. Such an action would violate the foundation of small business law in this country, and more than half a century of legal precedents. It would also violate the “common sense” understanding of most citizens about the proper definition of a small business and the proper use of taxpayer dollars intended for small business. The most persistent controversy in this area has been about the conditions under which venture capital companies can participate in the SBIR Program.

It is often stated that venture capital companies are “prevented” from participating in the SBIR Program.

This is incorrect.

**VC’s can participate in the SBIR Program.**

The only limitation on VC participation is determined by a two-pronged test.

**Prong # 1:** Does the VC seek (or hold) a minority or a majority ownership position in the SBIR company?

If the answer is a minority position, then any VC-backed SBIR company – and any VC -- is free to participate in the SBIR Program as it wishes.

**Prong # 2:** Is the VC itself a large business, with 500 or more employees, including affiliates and subsidiaries?

If the answer is no, then the VC may participate in the SBIR Program in any manner it wishes, as either a majority or a minority shareholder in an SBIR company.

If the answer is yes, then the VC may seek (or hold) only a minority position in an SBIR company.

In other words, VC’s can and do have access to the SBIR Program. In fact, the percentage of VC-backed companies in the SBIR Program has been rising. The sole purpose of the VC restriction in the SBIR Program is to prevent an SBIR company from becoming a subsidiary of a large business and still access funds that Congress intended for small businesses.

Subsidiaries of large companies have not been able to access funds or programs legally designated for small business since the enactment of the Small Business Act and the related “affiliation rule” in 1953, long before SBIR’s enactment in 1982.

SBIR receives only 2.5% of extramural federal R&D. SBTC sees no reason to divert any of these funds to large companies that are eligible for the other 97.5%. We have, however, repeatedly offered to work with the large venture capital companies that are seeking innovation funding from Congress, to try to address their concerns in other ways. The matching of VC investments in biotechnology with funds from the
National Institutes of Health, which the VC and biotechnology industries reportedly are seeking from Congress and NIH, represents one such path.

A further danger, should large VC's be permitted to hold majority interests in SBIR companies, is that absent extensive monitoring and evaluation, such VC control could quickly shift from being allowed to being required, as a selection criteria for SBIR contract awards. A concentration of large VC influence in the SBIR Program would also skew SBIR dollars more toward the handful of local areas, such as Boston and San Francisco, where most VC investments tend to be directed. As noted on page 7, above, the SBIR Program is far more egalitarian in its investments.

**SBIR/STTR and the Universities – expanding a successful partnership**

The STTR Program, enacted in the 1990’s, provides an important adjunct to SBIR by facilitating partnerships between small, technology-based businesses and Universities. Like SBIR, STTR offers an important venue for public-private, and nonprofit-private, partnerships in pursuit of technological innovation. SBIR researchers often have ties to universities, and STTR researchers always do. The National Academy of Sciences report found that SBIR collaboration and subcontracting with universities was widespread. The STTR program has allowed this collaboration to grow.

In a separate and revealing study, the New England Innovation Alliance (NEIA) surveyed in depth 17 of its members that are participating in the SBIR Program. The NEIA study found that these 17 SBIR companies had 175 subcontracts with 101 different universities worth over $28 million, while employing 243 university professors and graduate students.

So this avenue of collaboration offers the promise of a classic win-win situation.

Together, SBIR/STTR companies and the Universities can:

- Identify University R&D with potential downstream commercial applications, strengthening this awareness and focus,
- Develop new revenue streams for the Universities through R&D sales and licensing,
- Supplement the income of University-based researchers that work on SBIR and STTR projects, thus aiding the Universities in attracting and retaining talented faculty,
- Expose students who work on SBIR/STTR projects, or intern at SBIR/STTR companies, to the world of commercial R&D, and
- Jointly transfer valuable technology to the nation as a whole.

As the shift in science and engineering talent from large companies to small ones makes clear (see Figure 4 on page 6, above), large firms are a declining source of employment for university science and engineering graduates. In fact, large firms outsource many of these jobs to foreign companies.

At the same time, however, the growth in science and engineering talent in small businesses makes SBIR companies a crucial source of future employment opportunities for University science and engineering graduates. Such attractive and realistic opportunities to collaborate with leading-edge technology companies can help Universities attract students to science and engineering careers in the first place.

Moreover, the STTR program is a locus of contracts and subcontracts that provide financial support to Universities.
A more robust STTR Program would hold significant promise of reinvigorating the growth in University patents (see Figure 6 on page 7, above) and in improving University performance in developing key innovations (see Figure 7 on page 8, above).

To enhance cooperation between Universities and small, technology-based companies, SBTC further recommends that the STTR share of federal R&D dollars be increased from the current 0.3% to 0.6% in FY2010 and 0.9% in FY2011 and thereafter.

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3 Hicks, Small Serial Innovators: The Small Firm Contribution to Technical Change, op. cit.


5 Ibid., p. 15


7 Ibid. (For a very thoughtful and nuanced analysis of this shift, see the White Paper by SBIR Founder Roland Tibbetts that is attached as an annex to this testimony.)

8 U.S. Small Business Administration, Small Business FAQ’s, 2009.


10 U.S. Bureau of Census and the Office of Advocacy, U.S. Small Business Administration