Homeland Security Institute

Venture Capital Concept Analysis

2900 South Quincy Street • Suite 800 • Arlington, VA 22206-2233

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HOMELAND SECURITY INSTITUTE

The Homeland Security Institute (HSI) is a Studies and Analyses federally funded research and development center (FFRDC) established by the Secretary of Homeland Security (DHS) according to Section 312 of the Homeland Security Act of 2002. Analytic Services Incorporated operates HSI under contract number W81XWH-04-D-0011.

HSI's mission is to assist the Secretary of DHS, the Under Secretary for Science and Technology, the DHS Operating Elements, and to consult with private industry, institutions of higher education, nonprofit institutions, and other government agencies in addressing national policy and security issues where scientific, technical, and analytical expertise is required.

HSI delivers independent and objective analyses and advice to support policy development, decision making, alternative approaches, and new ideas on significance issues.

HSI studies and analyses, undertaken by mutual consent between the Institute and DHS, are organized as Tasks in the annual HSI Research Plan. This report presents the results of research and analysis conducted under

Task 05-06(b): DHS Investment Strategy
Venture Capital Concept Analysis

The primary objective of Task 05-06(b) is to analyze methodologies employed by other agencies to evaluate investment options and foster innovation by commercial entities.

The views expressed in this report represent a consensus among the authors; they do not necessarily reflect official DHS opinion or policy.

Homeland Security Institute

Thomas J. Benjamin
Task Lead

Mary T. Tyszkiewicz
Deborah Prigal
Bernard M. Chachula
Debbie Testerman
Allifa Settles-Mitchell
Brian Coy

VENTURE CAPITAL CONCEPT ANALYSIS

Final Report

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For information about this publication or other HSI research, contact:

Homeland Security Institute

2900 S. Quincy Street
Arlington, VA 22206
Tel (703) 416-3550 Fax (703) 416-3530
http://www.homelandsecurity.org

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EXECUTIVE SUMMARY

To prevail in this war, we will fight on the frontiers of knowledge and discovery.[1]
— President George W. Bush

The Department of Homeland Security's (DHS) Science and Technology (S&T) Directorate and Private Sector Office tasked the Homeland Security Institute (HSI) to analyze the potential applicability of the United States Government Venture Capital (USG VC) models in discovering, spurring, and fostering technological innovation to meet homeland security mission needs. This 6-month study reviewed 12 existing USG VC programs, interviewed a representative group of 15 authoritative senior staff and substantive expert leaders involved with technology decisions at DHS, assessed the relative strengths and weaknesses of alternative USG VC approaches with respect to DHS needs, identified options, and provided recommendations.

Based on the study's findings, the HSI team recommends that DHS establish an internal Venture Capital Exchange (X-Change) Office. The X-Change Office would respond in the near-term to emerging technologies in the private sector, and in the longer-term could prepare DHS to make direct equity investments. The X-Change office would create a foundation for building relationships with entrepreneurs and private venture capital firms and allow the DHS technology requirements process to mature.

There are 4 USG VC program models. (See Chapters 1-2 and Appendix 2.)

1. Direct Equity Investment models make equity investments in companies that develop technology of interest to the sponsor.
2. Information and Collaboration models gather and disseminate information about technologies of interest to influence investment decisions.
3. Technology Transfer models foster commercialization and mass-market economies of scale.
4. Financial Risk Underwriting models spur investment by reducing financial risk for private investors.

Our interviews found that DHS officials had different views on the needs and priorities of the Department. Not surprisingly, these officials therefore had different views on the potential value of a DHS VC effort. However, we did identify some common themes, including the need to:

- Move toward a culture that is more "nimble" and embracing of technology innovation.

[1] Argonne National Laboratory. July 22, 2002. Speaking to staff while viewing homeland security demonstrations.

- Maintain multiple mechanisms for working with the private sector to deliver technology to the public, first responders, and other end users rapidly and inexpensively.

In analyzing the strengths and weaknesses of a USG VC model as reported by DHS stakeholders, the DHS opinions fell into the following categories (see Chapter 3 for more details):

- How DHS works as an agency: How would VC success be defined? What kind of culture change would be required? Could the VC program be an agent of that change?
- How DHS develops technology internally: Would the VC program help overcome barriers of proprietary information and standards development for new homeland security technology? How would the VC plan for end user implementation?
- How DHS partners with the private sector to develop homeland security technology: Would the VC be picking economic "winners and losers"? Would the program offer features of attraction and interaction not found in other mechanisms?[2] (e.g., an open venue for immediate feedback)?
- How DHS technology development funding could change with a VC program: Does DHS have the tolerance for risk necessary for VC investments? Can DHS make large enough dollar investments in a VC program to influence technology development?

HSI identified 5 options for DHS. (See Figure 1 and Chapter 4.) The first 4 options are based on current USG VC models. The last option distills a key feature of successful USG VC models into an incremental VC model, which can serve as a new developmental path to future innovative interaction with the entrepreneurial private sector.

[2] Current mechanisms include Other Transaction Authority (OTA), the Small Business Innovation Research (SBIR) program, the Rapid Technology Application Program, and traditional instruments such as Broad Agency Announcements (BAAs) and Requests for Proposal (RFPs).

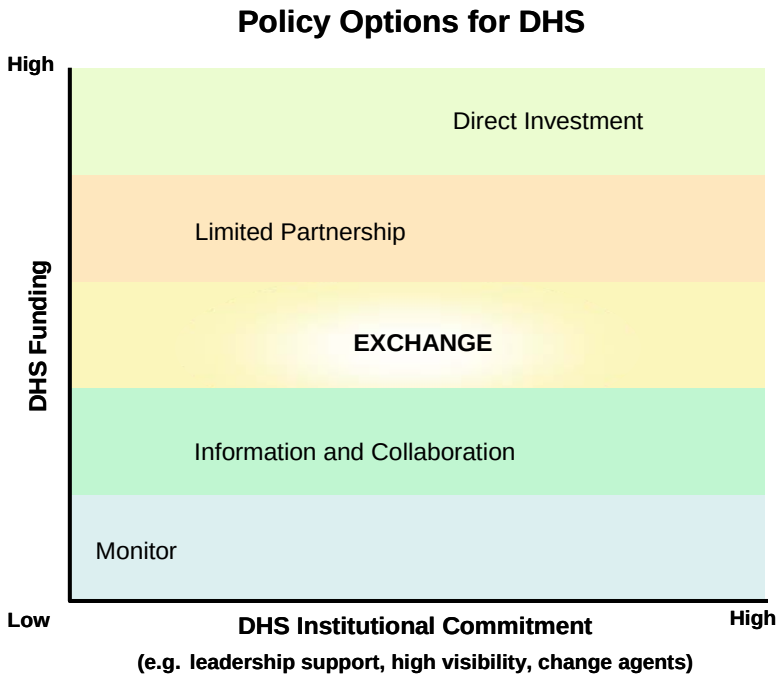

Figure 1: Policy Options for DHS

1. **Monitor Existing Models.** This option delays a decision until DHS has better defined its needs, engaged end users in the technology development process, and developed standards for new homeland security technologies. It allows DHS time to explore the optimal use of existing mechanisms and to gather additional information on other USG VC programs (The National Aeronautics and Space Administration's [NASA] VC program is just being established, and the Army's VC fund will soon complete a major review). This option is the least demanding in terms of funding and institutional commitment.

2. **Establish an Information and Collaboration Model USG VC**. DHS would designate an office to meet and work regularly with other USG VCs and the private sector VC community, like the Navy's VC@Sea and the DoD's DenVenCI programs. The office could also monitor publicly-announced transactions and develop a detailed statement of the homeland security technology areas of interest. This option requires more funding and institutional commitment than Option 1.

3. **Establish a Limited Partnership Model with One or More USG VC Funds**. DHS would become a limited partner in one or more of the existing VC funds, rather than create its own, potentially competitive, program. Benefits of this option include sharing infrastructure, overhead, and expertise with other sponsoring agencies. Disadvantages for DHS include limited control over the program focus and the possible

need for statutory and other agency approval. Compared with Option 2, this option requires a similar degree of institutional commitment but slightly greater funding (at least $5 to 10 million a year).

4. **Establish Direct Equity Investment Model**. This option would establish a program patterned after the Central Intelligence Agency's (CIA) In-Q-Tel and the Army's OnPoint programs. Benefits to DHS are a high degree of control and clear visibility to innovators. Disadvantages include relatively high startup costs, and a relatively long time (perhaps 2 to 3 years) before notable results could be expected. This option poses several challenges. First, it would require that the investing office be closely aligned with the technology needs of end users, needs that are not yet well defined. Second, DHS may find it difficult, at this stage of its maturation, to adopt the high-risk tolerance that this option requires. Third, the VC market may already be saturated with USG VC programs. This option requires the highest level of institutional commitment and funding. And fourth, it will be difficult to find new federal money for this option (at least $25 million a year for 8–10 deals), given the demands posed by the war in Iraq, the Global War on Terrorism, and responses to Hurricanes Katrina and Rita.

5. **Create an Internal DHS Venture Capital X-Change Office Model**. This option offers a middle ground between Options 2 and 4. It would establish a DHS liaison with the private sector, which we liken to an exchange.

Recommendation to DHS: Establish an Internal DHS Venture Capital X-Change Office

The HSI research team recommends that a DHS VC Exchange (which could be called X-Change) be established as the preferred option, based on our study. The X-Change Office would, in the near-term, prepare DHS to follow various paths with the private sector.

Advantages

This option is the best one now, because it sets up a mechanism that is necessary for both potential future information and collaboration or direct equity investment options. The DHS X-Change office would enable a more detailed analysis of DHS VC value over a longer period of time than was possible in this study. Also, if a compelling deal were to emerge, the DHS VC X-Change mechanism could accelerate a transition to a direct equity investment model.

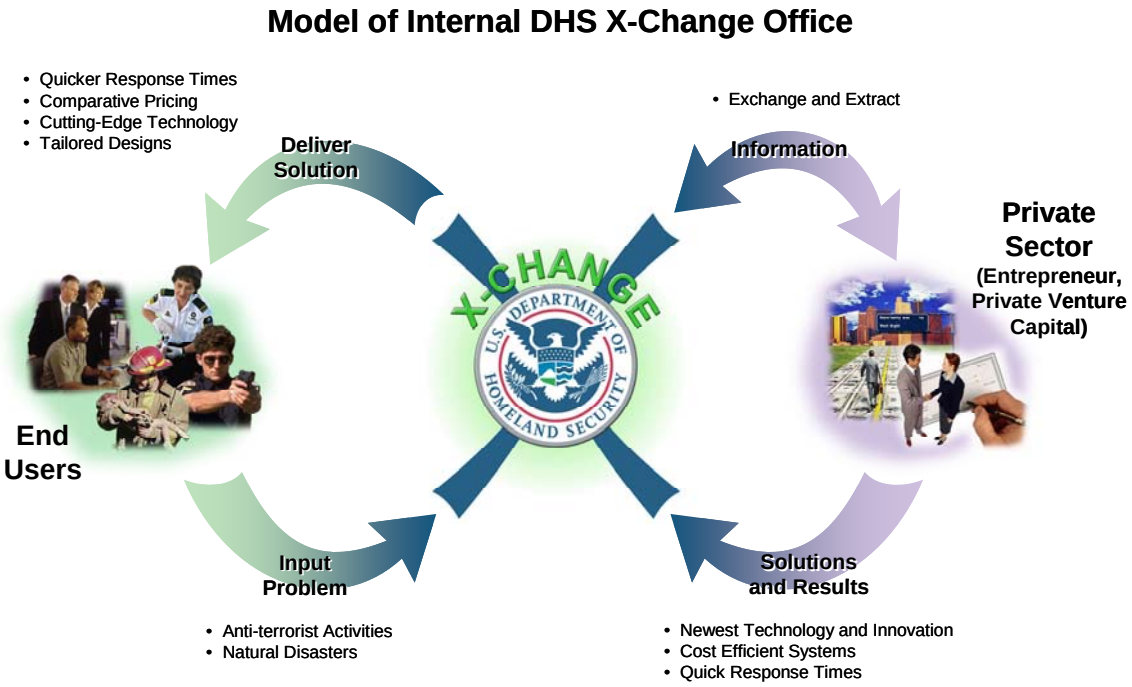

Figure 2: Model of Internal DHS X-Change Office

The DHS VC X-Change would create a foundational relationship between DHS and the private venture capital sector. (See Figure 2, Model of Internal DHS X-Change Office). This internal office would be the place in DHS to exchange and extract information and expertise with entrepreneurs and private venture capital firms, as shown in the Model. The information gathered in the DHS VC X-Change would immediately help DHS to be responsive and flexible with the commercial sector and supply solutions and results to end users.

End-user needs are important components to the DHS VC X-Change, as shown in the Model. DHS VC X-Change staff would gather homeland security problems from an end-user perspective and exchange that information with the private sector in a venture capital perspective. In collaboration with the private sector, the X-Change office would be able to deliver effective, less expensive, and faster solutions to homeland security problems.

The DHS VC X-Change should be populated with both experienced DHS staff who know the Department's mission and technology needs, and people with deep, current, commercial experience who would serve for no more than 2 years. This coupling of inside and outside expertise has been a hallmark of successful VC programs, and can be emulated without creating a free-standing non-profit USG VC corporation on the outside. Indeed, some private corporations may be willing to detail key people on a nonreimbursable basis for the career growth experience this would offer. The maximum tenure is essential because knowledge and networks fade quickly: these members must have current knowledge and networks in the private sector to open the lens of DHS to new opportunities.

The benefits of this option include (1) the DHS VC X-Change can be implemented quicky under existing authority. (One exception: the use of commercial detailees may require legislation.); (2) the DHS VC X-Change can get DHS ready for either evaluating limited partnerships with an existing fund, or for establishing a nonprofit corporation for direct investment; (3) the DHS VC X-Change can begin the Navy-like Information and Collaboration model dialogue right away.

Disadvantages

The downsides of this option are that it is a half step and may not open all the doors that DHS needs to the commercial sector. Without direct investment, private VCs may limit their recommendations to companies that are already in search of markets for existing products, as opposed to the developmental stage companies whose products may not emerge without DHS help. Similarly, if the DHS requirement-generating mechanisms are immature, nonexistent, or dysfunctional, they will need additional investment before they can credibly and efficiently communicate market opportunities to the venture capital community.

INTRODUCTION

Good ideas are a dime a dozen. Just ask any venture capitalist who is deluged daily with business plans and importuning entrepreneurs. The idea, by itself, just isn't good enough. What is required is the ability to transform the idea into a product that the marketplace accepts. [3] — Bob Cochnar

Purpose of Study

Our study of venture capital (VC) activities is a look at how to produce better tools to fight the war on terrorism and how to handle natural disasters by getting new homeland security technologies to DHS, emergency personnel, and others quickly and inexpensively.

We live in an age of ferment. The pace of technological renewal is mind-boggling. Societal issues abound. There's a war on. Pressures are exerted from every quarter to reengineer government, trim budgets, and do things better, faster, and cheaper. The private sector is held up as a model of efficiency, a model to be emulated. However, some look to the federal entities to ensure that the flow of resources is based on societal needs, not merely expediency.

As a general proposition, the government's share of research and development (R&D), as compared to the total in the economy, has been shrinking. Consequently, the government has less command of the overall processes of developing new ideas. In this context, some of the advocates for speedy insertion of technology believe that venture capital processes hold great promise of getting better, faster solutions to DHS.

A fundamental dilemma in analyzing information related to the myriad of venture capital activities of agencies is identifying the objective. Is the goal to make money? Be technology creators? Create jobs or put unused technology to use? Or rather, is the goal to be a technology finder and solution developer?

Structuring venture capital activity within the private sector is challenging enough. When the task becomes applying this commercial process to the federal sector, it becomes a different matter. The federal government has goals that do not normally include making a profit. Federal agencies do not normally run businesses, make commercial investments, or develop commercial products. There is not a lot of guidance out there for the trailblazers beginning these activities nor for the ones evaluating their work. Challenges abound, including the matter of developing—finding, using—a common language between agencies and the private sector and among agencies themselves.

A more philosophical issue relates to the creation and operation of venture capital activities that support the government. The critics say the government, even through surrogates, should not participate in the private equity market and "pick

[3] Robert J. Cochnar August/September 2005. "Putting Your Best Foot Forward," *TechComm, The National Journal of Technology Commercialization,* p. 6.

winners." They look on such quasi-governmental, hybrid entities as "contributing to a weakened capacity of government to perform its fundamental constitutional duties, and to erosion in political accountability, a crucial element in democratic governance."[4]

Purpose of Report: Focus and Limitations

The purpose of the report was to review the VC concept for DHS from a neutral, third-party perspective. Therefore, the focus of our research was to explore whether a USG VC program would or would not be a useful mechanism to support homeland security technologies.

The study did not do an analysis of DHS needs and requirements, which will be necessary to move forward in implementing a VC model. Also, due to the time frame of the study, the self-reported information from government VC programs was not independently audited.

Other important stakeholders outside of DHS were not interviewed. This group includes principals from current USG VCs, private VC firms, entrepreneurial technology providers, and technology vendors. In the future, they, along with end users from state and local authorities and the private sector, should be contacted about their views.

Research Approach

This 6-month study had 3 parts. Part 1 was a review of current USG VC models, using publicly-available information, data, and documents. Part 2 was semi-structured interviews with 15 DHS stakeholders to gather their opinions on the potential usefulness of a USG VC for DHS. Part 3 was an analysis of the strengths and weaknesses of a USG VC in the DHS context. Based on this 3-part study, the research team proposed 5 prospective courses of action and recommended one. Chapter 1 and 2 contain Part 1; Chapter 3 contains Part 2; and Chapter 4 contains Part 3.

Organization of Report

Chapter 1 gives an overview of venture capital. Chapter 2 outlines the history and context of USG VC models. Chapter 3 reviews what the study team learned from the 15 representative DHS stakeholders in semi-structured interviews. Chapter 4 presents findings and recommendations about VC policy options for DHS. Appendix 1 presents the detailed qualitative research design for the DHS stakeholder interviews. Appendix 2 presents a comparative chart of venture capital funds. A bibliography and a list of abbreviations complete the report.

[4] Moe, R. and K. Kosar. May 2005. "The Quasi Government: Hybrid Organizations with Both Government and Private Sector Legal Characteristics." *Congressional Research Service*, Library of Congress, CRS Report RL30533.

CHAPTER 1: VENTURE CAPITAL MODEL OVERVIEW

Venture capital as an innovation engine has existed for many decades. Beginning as a means for individual investors to fund new or growing companies in exchange for an ownership interest, venture capital is now dominated by limited partnerships or other types of entities that pool funds from numerous investors. In 2004, venture capital firms flowed about $21 billion to individual companies. The historic high was reached in 2000, when almost $90 billion was invested by the venture capital community.[5] The precipitous decline of the NASDAQ in March 2000, and the stress on the markets after 9/11 brought an end to the "Internet bubble" and record flows of venture capital.

Traditional or Private Venture Capital Model

Under a traditional or private venture capital model, the investor (VC) pools funds from limited partners to form a venture fund. The VC (which can be an individual or a firm) reviews business proposals from entrepreneurs, who need either to continue to develop a product, or to build a company around a developed product. The VC as investor provides funds to the entrepreneur (or "startup" company) in exchange for a proportionate ownership in the company. For example, if the startup has an apparent value of $10 million before the investment (or, "pre-money") and the VC provides an additional $5 million in capital, the VC could expect to receive a 33% stake in the company, now valued at $15 million.[6]

The VC takes a high risk in this effort; startups are frail and markets are fickle. VCs therefore exercise considerable influence over the companies they fund, via seats on the board proportionate to their ownership. Many startups will fail and the VC's investment will be lost. However, some startups will succeed, and will either be acquired by larger firms or will go public, i.e., sell their shares on a publicly traded market. If the startup is attractive and is perceived to have high potential for growth, the acquisition or public offering may return many times the present value of the company. In the example above, if the startup valued at $15 million after the VC investment is sold for $60 million, the VC's one-third share is now worth $20 million, representing a 400% return on investment.

In the heyday of the Internet boom, the time from investment to exit shrank to historic lows—sometimes only months. In more traditional markets, a VC may wait years and make several rounds of investment before a successful exit and return on investment. VCs manage their portfolio of investments to spread the

[5] PriceWaterhouseCoopers MoneyTree Survey, Q2 2005, http://www.pwcmoneytree.com/exhibits/05Q2MoneyTreeReport.pdf

[6] See generally National Venture Capital Association, Industry Overview, http://www.nvca.com/def.html

risk and timing, with a goal of earning an above-market return for their investors in a 3–7 year time frame. The winners are supposed to offset the losers—if a VC firm can successfully exit from 1 to 3 out of 10 investments, it will probably be considered successful. However, the number that really measures financial performance is the VC firm's internal rate of return, or IRR. The IRR is the compound annual return over the life of the fund, and provides a means of comparing the performance of VC funds against each other as well as against more traditional investments and indices.

Corporate or Strategic Venture Capital Model

A variant of the private venture capital firm is a corporate or strategic venture fund. Commonly a component or subsidiary of a corporation, the corporate venture fund has as its objective discovering or fostering companies that align with its sponsor's strategic direction.[7] Financial return is not the primary goal, although these funds must meet performance objectives like any other cost center for a corporation. The purpose of these funds is often to grow or protect their key markets. However, corporate or strategic venture funds may be able to take more financial risk since their objective is to foster technology that can advance the corporation's growth or competitive advantage. Many major corporations operate a strategic venture fund in addition to partnering with more traditional venture firms.

USG Venture Capital Model

Several aspects of the VC process have been of interest to the government and public sector. First, the VC draws business proposals and innovative ideas from a wellspring that is not generally available to the public. Indeed, some investment ideas are funded in "stealth" mode, i.e., so potentially compelling they are kept under wraps until the company is ready to market them. Second, the VC gets to interact with the startup at an early phase in the development cycle and has considerable influence over design choices and priorities. This presents an opportunity to inject new features and steer technology towards USG needs, or at a minimum get a head start on integration of the new capability with existing systems. Finally, the potential to recycle public funding, as returns on earlier investments are realized by the government venture capital entity, enables other investments that are in the public interest. Thus, VC allows a higher degree of risk taking than is normally possible with federal funds, and recovers the public money from a successful venture that has matured beyond the need for assistance.

[7] Major corporations that operate strategic venture funds include: Motorola, Microsoft, GE, IBM, Siemens, DoCoMo, Texas Instruments, Johnson & Johnson, Dupont and Intel. http://www.nvca.org/members.html.

The Government as a Limited Partner – Public Investment in Venture Capital

While the focus of this study is government-sponsored venture capital programs, in fact billions of dollars of public or public-managed funds already are invested in traditional venture capital funds.[8] This use of venture capital is solely for financial gain and is used as a hedge for low-performing investments in a portfolio. Many state pension funds, state university endowments, and state governments use venture capital investments as a tool in their investment strategy. The largest public institutional investor is the California Public Employees Retirement System (CALPERS), which manages over $22 billion in venture capital and other alternative investments for its beneficiaries, the state and local workers.[9]

Certainly the concept of public institutions having an equity stake in a private entity should not be the stumbling block. For example, according to a Government Accountability Office (GAO) report, universities, held equity in 348, or 70 %, of the 494 startup companies formed around university-licensed technology.[10] The GAO, citing data from the Association of University Technology Managers, said that taking equity in a start-up company, partially in lieu of cash fees, is an important licensing approach because startup companies rarely have a positive cash flow during their early period of existence.

This practice has gained some notoriety of late, as public interest groups or news media have pressed the governing agencies to release data on the financial performance of these public investments under state Freedom of Information Acts. The pressure has been highly controversial since financial performance such as internal rates of return are closely held by venture capital firms and are released only to limited partners who have contributed to a fund. The result is that many large venture capital funds have returned or refused investments from public agencies or entities that may be subject to such disclosure requirements. This development may be very detrimental to the long-term performance of these funds, since the above-average returns available from venture investing have generally benefited these public investment entities. If this lucrative investment option is no longer available to a program that is ultimately underwritten by the taxpayer, such as a state employee pension fund, overall returns may be reduced.[11]

Several different approaches to the USG VC programs have been considered or implemented. These approaches are surveyed in more detail in Chapter 2.

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[8] See generally http://seattlepi.nwsource.com/venture/91713_vc18.shtml

[9] http://www.businessweek.com/the_thread/dealflow/, Calpers' VC Talent Search (Updated), Businessweek, May 5, 2005, Justin Hibbard.

[10] United States Government Accountability Office, GAO-04-31. November 2003. "University Research: Most Federal Agencies Need to Better Protect against Financial Conflicts of Interest."

[11] http://www.pacificavc.com/blog/2003/08/13.html

CAPCO; State-Supported Venture Capital Programs

Many different forms of public-private partnerships to spur venture capital activity have been launched at the state level. Most of these programs have a goal of spurring new economic opportunity and job growth; many are focused on rural or less-developed areas. All of these programs share a common predicate. Some form of government assistance or encouragement is necessary to spur investment in start-up or emerging companies.[12]

One model that has gained popularity, and some criticism, is the Certified Capital Company, or "CAPCO." Nine states have adopted some form of the CAPCO model, for a total state commitment of over $2 billion.[13] Under a CAPCO model, the state encourages investment in local companies by providing tax credits to insurance companies in exchange for investments through certified venture capital companies under conditions imposed by statute. The CAPCO is allowed to apply for and allocate the tax credits to insurance companies that agree to provide investment capital to the CAPCO. The insurance company/investor gets a 1:1 credit, although there may be time-phased restrictions on the exercise of those credits (e.g., only 10% of the assigned credits may be exercised each year for 10 years). The CAPCO also assures a guaranteed return of the principal to the insurance company/investor, plus a modest interest rate (5% range). Because the goal is to create jobs and economic activity in specific geographic areas, the state sponsor of a CAPCO sets broad guidelines over eligible companies, but does not exercise any direct influence over the selection of investment candidates.

CAPCOs are meant to tap into large investment funds managed by insurance companies that without the tax credit incentive and guaranteed return on investment would not risk their capital on startup companies. Because the state is contributing tax credits that will reduce revenue in future years, and should be offset by the economic activity and tax revenues generated by new businesses, this has been seen as a low-cost means of spurring private investment. However, the model has been criticized as an inefficient means of providing state assistance to emerging companies. The CAPCO must use a large percentage of the investment fund it raises to set up a guaranteed return to the insurance company/investor (usually by investing in low-risk, government securities), and the CAPCO charges startup costs and management fees against the principal regardless of the level or success of any investment activity. An audit of the Colorado CAPCO program in 2003 found that of the $100 million in tax credits granted by the state, only about $40 million in resulting venture capital was going

[12] A comprehensive survey of many state-supported venture capital programs was published by the Rural Policy Research Institute in 2001. Nontraditional Venture Capital Institutions; Filling a Financial Gap, RPRI, http://www.rupri.org/publications/archive/reports/P2001-11/gap.html.

[13] Swope, Christopher, "Risky Ventures", Governing Magazine, April 2004.

to be available for investments in Colorado companies.[14] The legislature shortly thereafter cancelled the CAPCO program and began the state-funded Venture Capital Authority that could make direct investments in small companies.[15]

Types and Goals of Venture Capital Models

To understand how VC can apply to DHS, it is helpful to consider some of the goals of venture capital investing mentioned above, and their applicability to government programs (See Table 1.1).

One goal of private and corporate venture capital models is that they both want to create and find technology. Private VC focuses on making money, while corporate VC wants to recover money and create a business base.

Table 1.1 Types and Goals of Venture Capital

	Private VC	Corporate VC	Gov. Tech user (e.g. In-Q-Tel)	Gov. Tech creator (e.g. DoE, ARCH)	Gov. Bus Advocate (i.e., SBIC)
Make money	✓				
Recover, recycle money		✓	✓	✓	✓
Find technology	✓	✓	✓		
Create technology	✓	✓	✓	✓	
Put technology to broader use				✓	✓
Create jobs, business base		✓			✓

In contrast to private and corporate VC, USG VC programs have often been motivated by different goals. As seen in these 3 types of USG VC programs:

1. The *Government Technology User Model* has the same 3 goals as corporate VC: finding and creating technology, and recycling proceeds of investments. In-Q-Tel, the fund created by the CIA and serving the broader intelligence community, is the most prominent current example and is profiled in Chapter 2.

2. The *Government Technology Creator Model* focuses on creating technology, recovering money, and putting technology to broader use. This model is used to spin out technology that has been funded and created under government auspices. The goal has usually not been to generate revenue or recover cost, but rather to advance broader public (commercial) use of technology initially developed for a government purpose. One notable example (at least partly funded by government research dollars at inception) is the venture fund created in 1986 by the

[14] Report of the State Auditor, "A Review of Colorado's Certified Capital Company Program," October 2003

[15] "Milstead, David, "Colo. Invests in Biotech Firm," Rocky Mountain News, November 26, 2005.

Argonne National Laboratory and the University of Chicago. ARCH Venture Partners began as a modest nonprofit $9 million fund with the goal of commercializing promising technologies created at the lab and university. It has grown into a for-profit, $1 billion enterprise that has funded more than 110 companies.[16] The Department of Energy (DoE) models outlined in Chapter 2 fit into this category.

3. The *Government Business Advocate Model* funds have been established for broader public goals of commercial development, revitalization, and job creation. The nearly 50-year program of the Small Business Administration, the Small Business Investment Companies (SBIC), is also profiled in Chapter 2 and has had a role in the success of American icons Intel, FedEx, and Apple Computers.[17]

[16] ARCH view by Steve Lazarus, Founder, http://www.archventure.com/archview.html.

[17] SBIC Success Stories; http://www.archventure.com/archview.html

CHAPTER 2: USG VC MODELS

The HSI Study team collected, reviewed, and summarized numerous papers, articles or other materials written about the 12 existing USG VC programs.[18] These range from actual equity investment models, information and collaboration models, and technology transfer models to financial risk underwriting models. What is common to all the programs is the recognition that the VC process and the VC community play a critical role in technological innovation in the United States and beyond. It is often a complementary role to traditional federal R&D funding. Another common theme was a belief that some partnership with the venture capital community could fill a technological gap, or at least spur innovators to develop technologies that are aligned with the needs of the USG and public sector consumers.

The existing or former government-sponsored venture capital programs can be grouped into 4 categories:

1. *Direct Equity Investment*. These programs make actual equity investments in companies with technologies of interest to the sponsor. Examples are the CIA's In-Q-Tel, the Army's OnPoint, the National Geospatial-Intelligence Agency (NGA)/Army's Rosettex, NASA's proposed program, and the U.S. Department of Agriculture's (USDA) cancelled Alternative Agricultural Research and Commercialization Corporation (AARCC).

2. *Information and Collaboration*. These programs learn about new technologies by formal and informal collaboration with venture capital firms and organizations. Another objective is to disseminate information about the technologies of high interest to the government sponsors, to inform and influence investment decisions. Examples are the Navy's VCs@Sea and the Department of Defense (DoD) Defense Venture Catalyst Initiative (DeVenCI) programs.

3. *Technology Transfer*. These programs foster the commercialization and broader public benefit of government-funded technology. A secondary goal is the economy of scale that can result if a product is mass-marketed. Examples are the Technology Ventures Corporation at Sandia National Laboratory, and the fund started by Battelle Memorial Institutes, operators of the Oak Ridge National Laboratory.

4. *Financial Risk Underwriting*. These programs spur investment in small business or secondary-use technologies by reducing financial risk for private investors. They do this by making public funds available at below-market cost, or underwriting some portion of the investment risk. An example is the SBIC licensed by the Small Business Administration.

[18] Chapter 2 is based on an updated version of the May 2004 Wright Brothers Institute report, "Evaluate Initiation of an Air Force Venture Capital Fund."; Report WBI-2004-1.

Direct Equity Investment Models

Central Intelligence Agency

It's like a baby with a beard. Everyone is rushing to see it. [19]

— A.B. "Buzzy" Krongard

The most written-about agency venturing activity was started by the CIA, whose venture catalyst, In-Q-Tel, is now considered the forerunner of all recent federal venture capital activity.[20]

Credit for the formation of the CIA's venture capital arm is said to belong to Dr. Ruth David, who came to the CIA from the Energy Department's Sandia National Laboratories in 1995.[21] Troubled by the unmet technology needs she saw at the Agency (e.g., she didn't have Internet access at her desktop), she went looking for answers among industry, government, academia, as well as the startups and VCs in California, some of which told her that the CIA's market share would not be enough to bother with. Her opportunity came with the arrival of George Tenet as the then new Director of Central Intelligence, in 1997. Tenet's staffing changes included an investment banker, A.B. "Buzzy" Krongard. Coming from the world of finance, Krongard immediately saw the attractiveness of David's embryonic ideas.[22]

An early article on the birth of In-Q-Tel recounts the founders' logic: "The Agency's leadership recognized that the CIA did not, and could not, compete for IT (information technology) innovation and talent with the same speed and agility that those in the commercial marketplace, whose businesses are driven by 'Internet time' and profit, could. The CIA's mission was intelligence collection and analysis, not IT innovation. The leadership also understood that, to extend its reach and to access a broad network of IT innovators, the Agency had to step outside itself and appear not just as a buyer of IT but also as a seller. The CIA had to offer Silicon Valley something of value, a business model that the Valley understood, a model that provided those who joined hands with In-Q-Tel the opportunity to commercialize their innovations. In addition, In-Q-Tel's partner companies would also gain another valuable asset, access to a set of very difficult CIA problems that could become market drivers. Once the Agency's leadership

[19] A.B. Krongard was the CEO of Alex Brown Inc., a large investment bank before serving as Executive Director at the CIA during the formation of In-Q-Tel.

[20] In-Q-Tel uses the word "catalyst" instead of "capital" to signal that it is not like most VCs in that it accomplishes most of its goals without taking an equity stake in the companies it assists.

[21] Dr. David now serves as the CEO of Analytic Services Inc. (ANSER), the firm that manages the Homeland Security Institute, the federally funded research and development center (FFRDC) of the DHS.

[22] Laurant, A. June 2002. "Raising the Ante," *Government Executive*.

crossed these critical decision points, the path that led to In-Q-Tel's formation was clear."[23]

The CIA knew it needed to engage a trusted, venerable leader to guide this idea. Tenet approached Norm Augustine, former Lockheed Martin CEO, to give shape to the idea. The result was the creation of In-Q-Tel (originally named Peleus, Inc.) in February 1999 as a Delaware 501(c)(3) nonprofit.[24] A CIA press release, dated September 29, 1999 announced the official launch under the name In-Q-It and listed Gilman Louie as President and CEO, and Lee A. Ault, III, as Chairman of the Board of Trustees. As boards go, this one was impressive.[25]

Gilman Louie, brought on early as the President and CEO, was selected for his impressive credentials as an entrepreneur and street savvy player within the Silicon Valley culture.[26] He remains as the CEO of In-Q-Tel and has been profiled in numerous press articles.[27]

The CIA program was begun just as the dot.com bubble was about to burst. The timing probably helped In-Q-Tel get a firm footing in an environment suddenly lacking deals.

An extensive analysis of In-Q-Tel was directed by the Congress and was conducted in June 2001 by the Business Executives for National Security

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[23] Yannuzzi, Rick E. Winter 2000. "In-Q-Tel: A New Partnership Between the CIA and the Private Sector." *Defense Intelligence Journal*, Vol. 9, No. 1.

[24] For a very readable overview of the formation of In-Q-Tel, see Molzahn, Wendy. Winter 2003. "The CIA's In-Q-Tel Model: Its Applicability." *Acquisition Review Quarterly*, pp. 47-61.

[25] CIA Press Release. September 29, 1999. "In addition to Ault, former chairman and CEO of Telecredit, Inc., other members of the board included: Norman Augustine, former Chairman and CEO of Lockheed Martin; John Seely Brown, Chief Scientist, Xerox Corporation and President, Xerox PARC Research Center; Michael Crow, Executive Vice Provost of Columbia University; Stephen Friedman, Senior Principal of Marsh and McLennan Capital, Inc., and former Chairman of Goldman Sachs and Co.; Paul Kaminski, President and CEO of Technovation, Inc., Senior Partner in Global Technology Partners, and former Under Secretary of Defense for Acquisition and Technology; Jeong Kim, President of Carrier Network, part of the Lucent Technologies Corporation, and former founder of Yurie Systems; John McMahon, consultant to the Lockheed Martin Corporation and a former Deputy Director of Central Intelligence; Alex Mandl, Chairman and CEO of Teligent; and William Perry, a Senior Fellow at the Hoover Institution, the Michael and Barbara Berberian Professor at Stanford University with a joint appointment in the Department of Engineering-Economic Systems/Operations Research and the Institute for International Studies, and a former Secretary of Defense."

[26] Louie's accomplishments include being the former chief of online projects at Hasbro, the creator of the F-16 flight simulator and the marketer of the Soviet computer puzzle Tetris.

[27] A series of articles appearing in May 2005, published by the New York Post, raised questions about the method of employee compensation at In-Q-Tel and focused on an investment in an investee called Ionatron. Following that, an interview by C/NET.com raised the issue of that same investee's possible use of a discredited value-inflating practice called "pump and dump." Subsequent press coverage appears to have settled on the view that In-Q-Tel's compensation practices are not unusual by industry standard and that In-Q-Tel need not necessarily be tarnished by each and every questionable practice of an investee. *See*, Byron, Christopher. "Penny Stock Spies – CIA Fund Insiders Lurked Behind Three Shaky Stocks." *New York Post*, April 25, 2005. *See also*, Lacy, Sarah. May 10, 2005. "Meet the CIA's Venture Capitalist." www.BusinessWeek.com; Cooper, C. and M. Knellos. June 2, 2005. "The Secret behind the CIA's Venture Capital Arm." CNet News.com; Kerstetter, J. May 10, 2005. "Homeland Security: A Tech Boom This Time?" www.BusinessWeek.com.

(BENS).[28] The BENS study found that "the In-Q-Tel model makes sense, and its progress to date is impressive…," that "improved access of In-Q-Tel to key stakeholders and subject matter experts in the CIA is essential…" and that "In-Q-Tel's potential advantage to the CIA outweighs the risk."[29]

Of greatest importance was the study's focus on the mechanism the CIA used to direct the activities of In-Q-Tel. Although the BENS study's recommendation wasn't followed literally (it recommended the formation of an additional Intelligence Technology Oversight Panel), the study's focus ensured the agency's significant support of the In-Q-Tel Interface Center, called the QIC (pronounced "quick"). The agency calls this interface an "impedance matching" role, but at its most fundamental, it establishes for all other government models the importance of precisely defining the technology needs, a crucial step for the venturing activity to work. Also, due to the highly classified nature of the CIA's mission, the QIC allows In-Q-Tel to be staffed predominantly by experienced staff drawn from the private sector who do not hold security clearances. The CIA's needs are translated for them by the members of the QIC, staff who do hold necessary clearances.

The BENS study saw In-Q-Tel as mischaracterized to the extent that it was seen as a government VC firm. "Although In-Q-Tel has some characteristics similar to those of a venture capital firm, it also embodies many aspects of other models and operates more like a technology accelerator—able to take maturing technologies and rapidly ready them for market."[30]

BENS report participants, some 30 in all, came from a broad range of private sector experiences including high technology, VC, and the law. They admitted their initial skepticism and concern about the basic In-Q-Tel business model from a policy, legal, and competitive standpoint. They questioned why a government-funded entity should compete with private sector sources of money; why existing procurement processes couldn't satisfy the Agency's needs; why the CIA couldn't get enough insight into the marketplace just by asking. In the end, the panel's misgivings changed as the panel members began to see the positive aspects of what the CIA was trying to accomplish.

The report found In-Q-Tel to be combining several activity types and concluded that the CIA's approach had merit by drawing from the strength of each model, as shown below (Figure 3).[31]

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[28] BENS characterizes itself as a "nationwide, non-partisan organization [that] is the primary channel through which senior business executives can help enhance the nation's security."

[29] The Independent Panel on the Central Intelligence Agency In-Q-Tel Venture. June 2001. "Accelerating the Acquisition and Implementation of New Technologies for Intelligence: The Report of the Independent Panel on the Central Intelligence Agency In-Q-Tel Venture." *Business Executives for National Security*. http://www.bens.org/images/NQTel_Panel%20Rpt.pdf.

[30] Ibid.

[31] No follow-on study has been made public since the BENS analysis in 2001. The intelligence committees of both the House and the Senate, reportedly state that whatever reports they have on In-Q-Tel are classified. *See*, August 8, 2005. "In-Q-Tel: The CIA's Silicon Valley Bridge." *Red*

In addition to justifying the continued operation of In-Q-Tel, the insights from this analysis undoubtedly supported those in DoD who championed their own program, called DeVenCI, discussed later in this report.

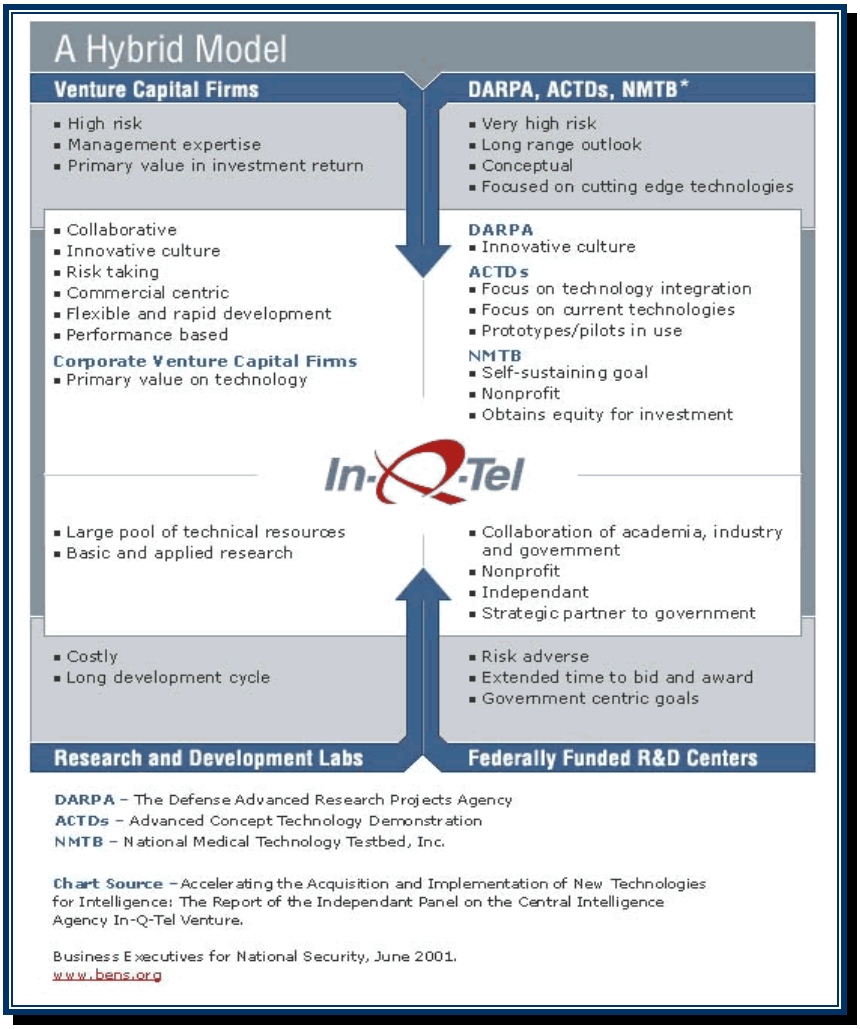

Figure 3: In-Q-Tel as a hybrid of other approaches[32]

In-Q-Tel is a private, independent, not-for-profit venture group funded by the CIA but chartered to support other agencies in the ntelligence community. Its mission is to "take the calculated investment risks necessary to support cutting-edge, but unproven technologies and convert them to operational technologies that serve U.S. national security interests. Working from an evolving strategic blueprint that defines the IC's critical technology needs, In-Q-Tel engages with

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Herring, http://www.redherring.com. This article also raised the matter of employee compensation, curiously comparing it to government pay scales instead of with a venture capital entity.

[32] This chart taken from a study of In-Q-Tel conducted by the *Business Executives for National Security* (BENS). April 26, 2004. See http://www.In-Q-Tel.org/about/model.html

entrepreneurs, established companies, researchers, and venture capitalists to deliver technologies that pay out in superior intelligence capabilities for its partners."[33] In-Q-Tel's principal customer is the CIA, but it also supports NGA, Federal Bureau of Investigation (FBI), and Defense Intelligence Agency (DIA). Since its inception, In-Q-Tel has reviewed more than 5,200 business plans and transferred approximately 100 technologies to the CIA. It currently has more than 80 active portfolio companies.[34] According to CEO Gilman Louie: "We have like 80 companies who put in about 100 technologies because some companies have more than one. As a percentage, about 50 % are in, 40 % are still being baked, and 10 % have been duds … so we're pretty successful."[35] Interestingly, 80% of the portfolio companies had no prior business with the USG and now 69% of these companies are selling to the USG. Also, 50% are now engaged in projects with one another, a synergy due in part to In-Q-Tel's nonprofit status and technology focus.

Figure 4 shows In-Q-Tel's operational steps. The final process element, "Transfer Solution to Agency," distinguishes In-Q-Tel from other VCs in that it forces In-Q-Tel to follow through on its previous activities as a venture capitalist and business catalyst. This final step may also account for a large part of the growth in technical staff members since In-Q-Tel's early days. In-Q-Tel now consists of 66 employees:[36] 8 or so deal makers and the remainder, technical specialists. This staff level should be compared to staffing levels in 2000 (about 20) and in 2002 (about 40). Other causes of growth are simply due to an increased budget and the size of In-Q-Tel's portfolios.

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[33] In-Q-Tel Website. April 21, 2004. "Corporate Overview," http://In-Q-Tel.com/about/index.htm

[34] In-Q-Tel Website, "Strategic Investments, Targeted Returns," http://In-Q-Tel.com/invest/index.htm August 17, 2005.

[35] Gilman Louie, Chief Executive Officer, In-Q-Tel, in an interview conducted by, Cooper, C. and M. Knellos. June 2, 2005. "The Secret Behind the CIA's Venture Capital Arm." CNet News.com. http://www.news.com. See also, "August 8, 2005. "In-Q-Tel: The CIA's Silicon Valley Bridge." *Red Herring*, viewed at http://www.redherring.com on 17 Aug 2005. "To date, the CIA-backed venture firm can boast an impressive run. It has reviewed 5,000 business plans and invested $100 million in 80 companies and 10 projects in university research labs. Of those, only four have gone bust – impressive considering the 50 percent failure rate typical in the venture business. In 2004, In-Q-Tel invested in about two dozen companies. It has been involved in the development of 100 technologies central to its intelligence mission, and 12 of its portfolio companies have been named to Red Herring's 100 Top Private Companies lists.

[36] "August 8, 2005. "In-Q-Tel: The CIA's Silicon Valley Bridge." *Red Herring*, viewed at http://www.redherring.com on 17 Aug 2005.

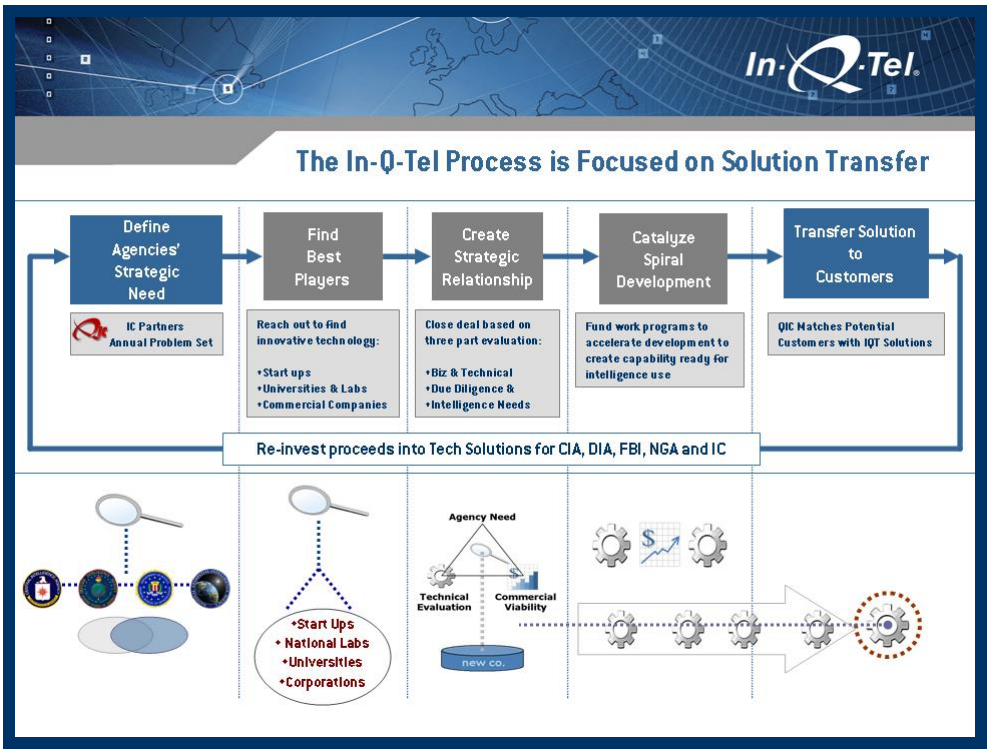

Figure 4: In-Q-Tel Solution Transfer Process

The business arrangement between the CIA and In-Q-Tel is formed by both a charter agreement and a contract, whose form is CIA-unique, but roughly comparable to an Other Transaction (OT) in DoD practice. The charter establishes the purpose of the relationship, that is, the overall technical and program planning and management to ensure applicability and transfer of In-Q-Tel's solutions to the CIA's problems. "Problem sets" are conveyed to In-Q-Tel, and the QIC is advised of proposed In-Q-Tel investments. However, its consent is not required for In-Q-Tel to make an equity investment. In practice, if a difference of opinion arises between the QIC staff and In-Q-Tel about a proposed investment, the matter is scrutinized again by the In-Q-Tel Board of Trustees.

In-Q-Tel's contract is funded annually, and In-Q-Tel is given a new problem set in each cycle (1 April to 31 March). This set is basically a fixed-price level of effort arrangement with no award fees or other incentives for spectacular success, although In-Q-Tel can reward its own employees for particularly noteworthy accomplishments. The patent and data rights provisions are fairly traditional, although an option for agency specific rights exists under certain circumstances.

Employee compensation, the subject of some recent press criticism, includes 10—25% of an employee's total compensation, depending on position, going into a mandatory employee's investment fund. For every $3 invested in a

company, $1 from the employee's fund is also invested.[37] The rationale of this approach is to emulate the financial driver of the VC model and motivate employees to make the best possible investment decisions on behalf of In-Q-Tel and its government customers.[38]

The CIA's QIC has complete access to the details of In-Q-Tel's deal flow. The contract does not specify particular ethics rules, instead placing the responsibility on In-Q-Tel and their Board of Trustees. Trustees of In-Q-Tel have signed agreements not to benefit from In-Q-Tel investments. In-Q-Tel is bound to the CIA through its contract, which requires it to get the Agency's approval for any work for other agencies. The sheer amount of activity at In-Q-Tel appears to be accelerating with its annual budget increasing from roughly $27 million to $65 million in the last 6 years and a total of about 137 transactions being completed. The pace in 2004 was a deal every other week—most in the neighborhood of $500 thousand to $3 million per deal.[39] Former CIA officials responsible for overseeing In-Q-Tel have expressed satisfaction with its progress to date. But, in the final analysis, the value of In-Q-Tel is still unknown. When posed that question, Gilman Louie responded: "The jury … is still out on the long-term strategic value of In-Q-Tel. Can In-Q-Tel be a critical component of the requirement for the U.S. intelligence community to make the necessary changes to deal with the new world threats? While In-Q-Tel can point to a lot of things in terms of technology, it really is about how that technology gets deployed in changing the culture in the new threat environment. The answer to that is, I don't know."[40]

National Geospatial-Intelligence Agency

In addition to providing funding to In-Q-Tel,[41] the NGA[42] has established another potential venture activity through a for-profit company called Rosettex

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[37] Lacy, Sarah. May 10, 2005. "Meet the CIA's Venture Capitalist." www.BusinessWeek.

[38] For an extensive description of the employee compensation plan, including its conflict of interest mitigating features, *see*, The Independent Panel on the Central Intelligence Agency In-Q-Tel Venture. June 2001. "Accelerating the Acquisition and Implementation of New Technologies for Intelligence: The Report of the Independent Panel on the Central Intelligence Agency In-Q-Tel Venture." *Business Executives for National Security*. www.bens.org/images/NQTel_Panel%20Rpt.pdf.

[39] Lacy, Sarah. May 10, 2005. "Meet the CIA's Venture Capitalist." www.BusinessWeek.

[40] Gilman Louie, Chief Executive Officer, In-Q-Tel, in an interview conducted by, Cooper, C. and M. Knellos. June 2, 2005. "The Secret Behind the CIA's Venture Capital Arm." CNet News.com. http://www.news.com. *See also*, O'Hara, T. August 15, 2005. "In-Q-Tel, CIA's Venture Arm, Invests in Secrets.", p. D01: "'On a scale from one to 10, I would give it an 11,' said A.B. "Buzzy" Krongard, the CIA's former No. 3 official and a former investment banker. 'It's done so well even Congress is taking credit for it.' Yet In-Q-Tel remains an experiment that even its most ardent backers say has yet to prove its full potential. 'In my view the organization has been far more successful than I dreamed it would be,' said Norman R. Augustine, who was recruited in 1998 by Krongard and George J. Tenet, who then was director of central intelligence, to help set up In-Q-Tel. Augustine, former chief executive of defense giant Lockheed Martin, is an In-Q-Tel trustee. 'But my view is also that it's still an unproved experiment.'"

[41] National Geospatial-Intelligence Agency (NGA) press release. April 2003.

[42] NGA, until recently, was known as NIMA, or the National Imaging and Mapping Agency.

Technology and Ventures Group ("Rosettex"). NGA pursues this relationship through the mechanisms of the National Technology Alliance (NTA), a program it operates as executive agent on behalf of the intelligence community, the DoD, and other government agencies.[43] The NTA has existed since 1987. As detailed below, the Rosettex Venture Fund will be built from fees generated by NTA contract revenues. However, to date sufficient activity hasn't occurred under the Rosettex Agreement to create a sufficiently large fund and, therefore, no investments have yet been made.

Rosettex operates through its Rosettex Venture Fund, focusing on seed and early stage capital investment.[44] Rosettex is led by Mark J. Lister, Managing Director, who also serves as the Chairman of the Naval Research Advisory Committee (NRAC), described below, as well as its VC panel. Rosettex is a joint venture of the Sarnoff Corporation and SRI International. It began operations in June 2001. Following a 6-month ramp-up, Rosettex won the majority of NTA work in February 2002. They have a 5-year OT contract, worth up to $200 million, to operate the NTA program for NGA.

Under the NTA program, Rosettex seeks to accelerate the development and deployment of commercial technologies for:

1. Imagery and motion imagery processing
2. Geographic information systems (GIS)
3. Cartography
4. Management of large volumes of disparate and distributed data enhanced decision-making
5. Enhancement of digital infrastructure capabilities, such as telecommunications, storage, and computing[45]

Rosettex supports the NTA by managing in a process called Independent Assessment and Evaluation (IA&E), which analyzes users' needs and finds the

[43] The National Reconnaissance Office (NRO) created the NTA and operated it from 1987 to 1992. It then moved to the Community Management Staff reporting to the Director of Central Intelligence (DCI). Thereafter, when NIMA, was created, the function went to NIMA (now NGA).

[44] Rosettex describes its venture fund in a marketing brochure as follows: "Today's VC investment in IT is incubating tomorrow's commercial products, systems, and revolutionary technologies. The independent Rosettex Venture Fund provides seed and early stage capital investment to companies with promising technology and solutions to government needs. No government funds are used to finance the fund or its operations. The fund is projected to total $50 million within ten years. The management of Rosettex Technology and Ventures Group and the Rosettex Venture Fund are linked. This brings together experts in venture funding with those with an understanding of government users' needs and systems. By teaming with VCs to share in opportunities for both the commercial and national security worlds, the government gains access to private emerging technology information, critical for acquisition planning, and benefits from private investments in emerging technologies – something never before exploited by the government."

[45] Ibid.

best solutions to meet those needs.[46] Rosettex then manages teams made up of independent R&D organizations, commercial product for service companies, and system integrators to implement solutions.

The Rosettex business model in Figure 5 below shows that the Rosettex Venture Fund is only a small (albeit important) part of the process. It begins with user-needs outreach, the ultimate driver of any business cycle. From this point begins a market and technology assessment conducted by a myriad of technology experts.[47]

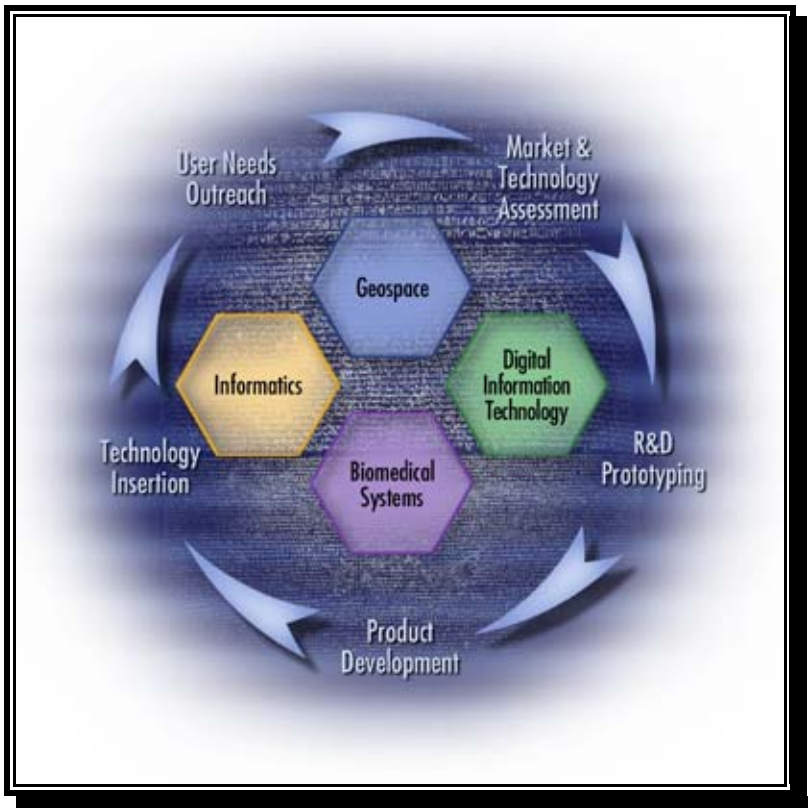

Figure 5: Key Elements of the Rosettex Approach

Potential solutions can be matured in the R&D prototyping process and candidates can be helped through the venture fund to fulfill the product development phase. Finally, a finished product can be inserted by systems integrators to enlarge existing systems and/or reduce their cost. This phase

[46]According to an NTA informational flyer, published in 2004 by Rosettex: "NTA partner companies, expert on the organization, missions, operation, and requirements of the communities they serve, identify needs and provide the essential analysis and outreach to Government users of information technology. A unique aspect of the NTA's approach is that potential solutions to identified needs are compared by well-respected independent experts in technology and market assessments, and best-of-class solutions and the most qualified suppliers are identified."

[47] Rosettex's Website depicts a standing team of over 75 leading information technology (IT) organizations. The entire list of defense contractors, consultants, consortia and universities that it calls partners can be viewed at: http://www.rosettex.com/about/our_team.asp

completes a cycle, and one cycle's conclusion provides the necessary user feedback to suggest a new round of activities.

Rosettex operates under task orders, using a staff of 6 to 7 to manage the workflow done through a network of over 75 partners. The venture capital activity is part of this arrangement.

Rosettex has created the Rosettex Venture Fund, an independent Limited Liability Corporation (LLC), and has agreed that all of its fees, net of taxes, will go to the fund. Thus, for example, if Rosettex is awarded $50 million in OT activity in a particular year and then generates a $5 million fee, that amount net of expenses would be added to the fund. The model anticipates that agencies working through Rosettex will be given a "seat at the table" to direct investments by the fund, potentially including investments in other funds.[48] Presumably, these would be investments that relate back to such agencies' strategic or tactical needs.

Upon "exit," that is, the fund's ending of its equity position with the entrepreneur (called the "investee"), the model calls for 75% of the growth (i.e., the difference between the invested amount and the net cash-out), plus the original investment amount, to be reinvested in the fund for future investing. The fund grows this way. Lister believes this approach to have attractive elements over other models because he feels the Rosettex plan permits the USG to more directly drive the course of investing decisions. Under other models, he says, "they are buying fish, not learning to fish themselves."[49] Because Rosettex is a for-profit entity, Lister believes it will have greater credibility within the venture capital community because Rosettex will have "skin in the game" through its direct investment strategy.

Depending on the level of future activity under the OT, Rosettex may be frustrated in achieving its goal of amassing a sufficiently large investment fund to do meaningful venturing activity. Also, there could be hurdles ahead once the opportunity of actual agency involvement in recommending investments becomes a reality. Also, the challenge of harmonizing agency mission-oriented investment suggestions and venture capital profit motives will not be simple.

Rosettex also has in place a 5-year agreement with the Army's Communications and Electronics Command (CECOM) at Ft. Monmouth, awarded in October 2002 that is said to be a clone of its OT with NGA. The purpose of this agreement is to develop and prototype advanced technologies and systems in military communications, command and control, intelligence, surveillance, and reconnaissance applications. Initial development projects include satellite-on-the-move communications, mobile ad hoc wireless networking, and visualization technology for situational awareness in Command, Control, Communications,

[48] To avoid problems with actual investment decisions being made by government employees, the arrangement calls for Rosettex customers to appoint non-voting "advisors" to provide input on the course of Rosettex's future investment decisions.

[49] Telephone conference call with Mark Lister. April 8, 2004.

Computing, and Intelligence (C4I) environments.[50] The agreement has a potential value of $24 million. This also presents an opportunity for Rosettex to increase the value of its investment fund.

Army

The Army commissioned a series of studies by the RAND Corporation to find better ways of acquiring advanced technologies using public-private partnerships (PPPs).

The first of these reports expanded on a paper presented at the Army Materiel Command (AMC) Executive Steering Committee meeting in April 1997.[51] It recounted progress being made in streamlining the Federal Acquisition Regulation (FAR) and the Defense Federal Acquisition Regulation Supplement (DFARS). It lauded the creation of new tools such as Cooperative Research and Development Agreements (CRADAs), Cooperative Agreements (CAs), and OTs as helping the Army deal more effectively with the private sector. The report also recognized the more effective use by the Army of leasing authority under 10 U.S.C. 2667.[52] But the report also saw the great challenges facing the Army with the "continuing decline" of the Army's S&T budget, laboratory reorganization, and Base Realignment and Closure (BRAC) actions.

The RAND report described the Army's contributions to PPPs as likely, including use of its "vast holdings of property, buildings, other tangible assets such as equipment, specialized areas such as disposal facilities, and the systems that govern their operation."[53] It also recognized the value of the Army's potential contribution in its "scientific expertise, patents, databases, and other elements of its knowledge base." Finally, although the Army did not yet have a financial PPP, the report felt that such an arrangement could provide "marketing expertise and access to capital."

The RAND report generated an extensive list of PPP ideas and graded them in the following categories for acceptance: attractive, legal, public, political, and within Army.

One idea listed was an incubator arrangement where the Army could contribute a facility, such as a research center, for startup firms doing R&D in dual-use areas. The Army, it was envisaged, would take equity in the firms in return.[54]

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[50] SRI International Press Release, October 21, 2002. "Rosettex Signs Five-Year, $24 Million Contract with U.S. Army Communications-Electronics Command (CECOM)." http://www.sri.com/news/releases/10-21-02.html.

[51] Chang, Ike, et al. 1999. *Use of Public-Private Partnerships to Meet Future Army Needs.* Santa Monica, CA: RAND, MR-997-A.

[52] Title 10, United States Code, Section 2667, "Leases: Non-Excess Property."

[53] Chang, op. cit., p. 11.

[54] Ibid., p. 67.

Another idea was an Army equity fund, which was categorized as "likely" under the legality category and "possible" under the remaining measures of analysis.[55]

The Army equity fund idea was described as follows: "Under this concept, the Army invests a small portion of its R&D funds as a cornerstone limited partner in an equity fund chartered to develop Army and dual-use products and services. As a cornerstone limited partner, the Army helps attract other limited partners who provide the majority of the fund's capital.… Army returns on its investment in the fund can be deposited in a revolving account and used to research and develop other products of Army interest or reinvest in further R&D equity funds."[56] The report went on to counsel against the Army having direct involvement in investment decisions, but otherwise went into relatively great detail in describing the nature of the arrangement being proposed.[57]

A RAND Issue Paper followed in 2000, summarizing and updating the work in the earlier study. It stated that the "reasons for venture capital's success are its inherent incentives and an organizational structure that facilitates the development of innovative ideas. Young, small, and growth-oriented companies typify the investee. Their potential products or services are new and intended to develop new markets or redefine older ones. The company founders are risk takers, motivated by their vision. The investors are experienced businessmen and businesswomen, risk takers as well, but they expect to be amply rewarded for taking those risks." The report suggested the Army could tap into a combination of these entrepreneurial skills to capitalize on such an innovation engine.

On the other hand, it concluded that "the development of collaborative ties between the Army's R&D community and commercial technology developers is difficult given the Army's traditional contracting methods. Army contracting officers, often lacking the training, resources, and authority to conduct market research, tend to rely on a traditional contractor base to meet the government's needs. Commercially oriented companies weigh the small size of the Army market against the burdens associated with the government's ponderous procurement rules, inflexible oversight requirements, and concerns about intellectual property. On balance, the benefits of collaboration generally fail to overcome the burdens."[58]

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[55] Ibid., p. 48.

[56] Ibid., p. 65.

[57] Ibid., p. 65. "In the Army equity fund, the Army has some expertise in the industry area but very little, if any, in investment banking. The private fund general partners develop a highly focused investment strategy and return-on-investment objectives. Diversification, expressed in terms of limits on single investments (say, 10 percent), is used to minimize risks. The general partners provide the initial capital, which is usually 2.5 to 10 percent of the total. They raise the balance of the capital from limited partners. [T]he general partners receive organization expenses and placement fees of 2 to 3 percent, management fees that are typically about 2 percent per year, and 20 percent or more of total gains after return of capital."

[58] Held, B. and I. Chang. 2000. *Using Venture Capital to Improve Army Research and Development*. Santa Monica, CA: Rand Corporation Arroyo Center.

In July 2001, the Army Science Board concluded a Direct Equity Investment program model would not serve the Army's technology needs. In particular, they concluded that:

- An In-Q-Tel patterned solution was not the answer for the Army.
- Existing tools executed with greater innovation would solve many problems.
- The Army "has no way to continually evaluate and obtain commercially derived militarized solutions that would be accepted, adopted and procured for high priority Army problems.
- Establishing an Army Venture Capital Fund would not provide a solution to Army R&D funding shortfalls.[59]

The Science Board study didn't end the Army Direct Equity Investment program model debate, but produced yet another RAND study in 2002. This one expanded on a briefing presented to the Assistant Secretary of the Army (Acquisition, Logistics, and Technology) (ASA[ALT]) in January 2000.[60] Whereas the 1999 study covered the equity fund idea in less than 2 pages, this report devoted over 20 to the issue.

The report recounted the asymmetry in R&D activity, the growing technology challenges, and declining budget. It pointed out that commercial R&D is not done solely at the product development stage, contrary to public perceptions. Thus, the Army could leverage its contributions in a wider range of activities. Specifically cited was an Army Science Board view that many ongoing commercial R&D activities would mature in time to measurably assist the Army's Future Combat Systems (FCS) initiative.[61]

The 2002 RAND report broadened the scope of the discussion by making the point that not all venture capital activity required an equity investment. "Other investment mechanisms, such as royalties on future profits or high-risk, high-interest loans, also fall into the category of venture capital."[62] The report, drawing on In-Q-Tel's experiences, also described the changing landscape of the VC community in terms of its going into earlier-stage deals and being more aggressive in creating new companies.[63] It described corporate uses of venture

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[59] Army Science Board, Venture Capital Panel. July 25, 2001. Version 5.0 viewed at http://webportal.saalt.army.mil/asb/studies/vc-brf.pdf.

[60] Held, Bruce, et al. 2002. *Seeking Nontraditional Approaches to Collaborating and Partnering with Industry*. Santa Monica, CA: RAND, MR-1401-A.

[61] Ibid., p. 34.

[62] Ibid., p. 41.

[63] Ibid., p. 41. Fn 18: "Traditionally, venture capitalists relied on requests for funding from entrepreneurs to identify potential investment opportunities. That may be changing now. Gilman Louie, the CEO of In-Q-Tel, told us in an interview that more venture capitalists are creating investment opportunities themselves by identifying potential market niches and creating companies from scratch to fill those niches. This model may be more appropriate for an Army venture capital fund."

capital mechanisms (Xerox, Microsoft, Lucent) as well as the Department of Energy's Argonne National Laboratory relationship with the industry through the ARCH Venture Fund.[64]

A notional name was given to an Army equity capital experiment, the Army Innovation Investment Corporation (AIIC). The writers contemplated the formation of an agreement with an existing venture fund or with a federally funded research and development center. They imagined the use of OT authority under 10 U.S.C. 2371, where the principal purpose of the arrangement would be research, with the venture capital aspect being merely an accident of achieving that end. The report admitted, however, that an OT "has never been used in this manner" and that it might be problematic.[65] Thus, they recommended that a better course of action would be to seek unambiguous statutory authority. Still, they said that even this represented a risk for the Army. The Army could lose control of the process; thus, time delay and "political capital" would be needed to advance the idea.

Given these realities, the report suggested pursuing a combined approach, doing whatever possible under an OT while garnering support within the Army, and in Congress, for statutory authority. In the end, it may be that Congressional support advanced sooner than the Army's commitment of the concept and legislative authority materialized in such a way that there was really no staged adoption of venturing techniques.[66] Throughout this period, while the Army was gaining a clearer picture of its possible use of venture capital tools, a similar activity was taking place in the Navy.

RAND studies conducted for the Army estimated that it would take $2 million to set up a venture capital entity with approximately $30 million budgeted annually in the first 5 years of operation. Then, if successful, RAND believed the activity could be self-sustaining with an investment portfolio averaging $150 million. To put the portfolio fund number in context, the Army Research, Development, Testing & Evaluation budget line in FY2002 was $7.046 billion dollars.[67] RAND believed this activity would best be managed by an Army Advisory Committee consisting of "personnel from the Army Materiel Command (AMC), the Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology

[64] Ibid., p. 45.

[65] Ibid., p. 49.

[66] Department of Defense Appropriations Act, P.L. 107-117, Section 8150. *See also* Conference Report to accompany H.R. 3338, pg. 53. December 19, 2001. "The amount specified in subsection (a) [of Section 8150 of the Act] shall be derived by reducing, on a pro rata basis, amounts made available to the Secretary of the Army for basic R&D, except for amounts for research projects designated as Congressional special interest items and amounts available to the Army for research, development, test and evaluation relating to the future combat system.

[67] Under Secretary for Defense (Comptroller). March 2003. *National Defense Budget Estimates for FY2003.* p. 171. This $7.046B is Army budget authority in current FY2003 dollars. This report can be accessed at: http://www.dod.mil/comptroller/defbudget/fy2003/fy2003_greenbook.pdf.

(ASA[ALT]) and the Training and Doctrine Command (TRADOC) [and] would form the interface between the Army [and the venture capital entity]."[68]

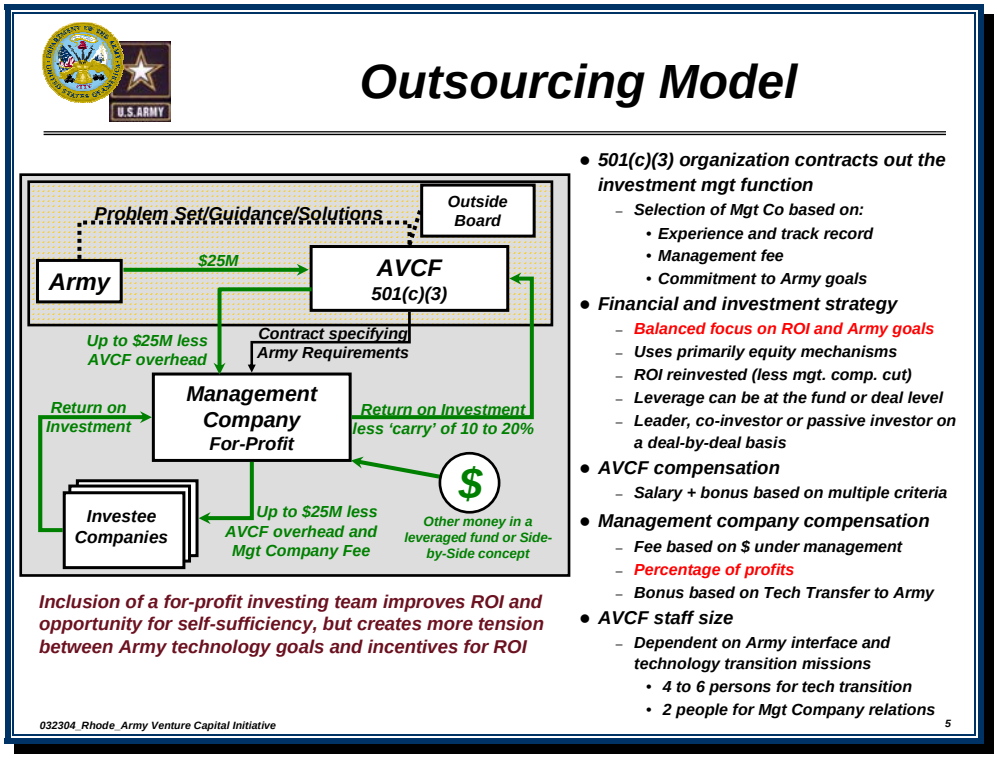

Figure 6: Army Outsourcing Model

The source selection, with technical support by RAND, proceeded to the selection of MILCOM Technologies (Management Company: For Profit). The MILCOM engaged with representatives of OnPoint Technologies, Inc. (AVCF 501c3), a newly created nonprofit created to work with MILCOM because of the statutory requirement that the Army use a nonprofit entity for its VC activity. (See Figure 6 above.)

As a result of this process, much of the OT between the Army and OnPoint deals with limitations having to do with OnPoint's management contract with MILCOM.

Army personnel at CECOM built 2 incentives into their agreement with OnPoint. The incentives operate on the management agreement OnPoint has with MILCOM Technologies: adoption (transition) of technologies by the Army and value generation (profit on exit).

A Board of Trustees was created for OnPoint, but the Army decided not to directly nominate members for it, instead taking the indirect approach of "recommending" 2 of 5 names.

[68] RAND. April 27, 2004. "The Army as Venture Capitalist: An Innovative Approach to Funding Research and Development." Downloadable at http://www.rand.org/natsec_area/products.vc.html

While it focused its startup activities on manportable power, the Army's OT with OnPoint allows for additional topics to be added later. The biggest difference, in the Army's eyes, between its activity and that of the CIA is that the CIA promises contracts to certain businesses, which makes for easier access to the marketplace.[69]

The parent company of OnPoint, MILCOM Commercial Technologies, Inc., was founded in 1997. Its MILCOM Venture Creation (MVC) group conceives, creates, and launches technology companies in concert with MILCOM Technology Partners and other entities. Over the past 5 years, MVC has launched 13 companies which have attracted more than $600 million in venture capital funding. MILCOM has a staff of over 20 investors and entrepreneurial professionals. Its Strategic Advisory Board consists of a group of very senior former DoD officials, and many members of the board are also current or former members of the President's Defense Science Board.[70] The firm focuses on companies in the advanced materials, communications, healthcare, IT, and security sectors. Companies that MILCOM has launched include GlobalSys Services, an Orlando, FL-based provider of offshore programming services; MeshNetworks, which is developing a mobile multi-media Internet platform; SkyCross, which designs, develops, and manufactures antenna technology; and TeraNex, which develops image processing technology.[71]

MILCOM manages OnPoint, now a $40 million venture fund (total funding to date) that lists 8 companies in its portfolio.[72] OnPoint made its first investment in November 2003. It has not operated with budgeted funds. In its first year, it used a $25 million "tax" against the Army's 6.1/6.2 R&D budget. For fiscal years FY03-FY05, it operated under a statutory provision in the FY03 Appropriations Act which allows the Army to sweep funds that have expired, but have not yet lapsed or "closed," for use in the VC activity.[73] Funds were $12.6 million in FY03 and $10 million in FY04. How much will be made

[69] The "promise" of business is a bit misleading here. In-Q-Tel makes a policy of having at least one procurement contract or OT-like arrangement with each investee. Thus, whenever In-Q-Tel takes an equity position, it also awards a contract of one type or another for a study, model, simulation, and so forth. Ultimately, the investee must still compete for contract awards before the Agency once its product is "adopted" by the Agency.

[70] MILCOM overview statement.

[71] Sheahan, M. L. June 16, 2003. "Milcom Marches to Army's VC Orders." www.privateequityweek.com.

[72] http://www.onpoint.us/portfolio/index.shtml (August 17, 2005).

[73] P.L. 107-248, October 23, 2002, 116 Stat. 1562: "During the current fiscal year and for fiscal years 2004 and 2005, notwithstanding any other provision of law, the Secretary of Defense may transfer not more than $20,000,000 of unobligated balances remaining in a Research, Development, Test and Evaluation, Army appropriation account during the last fiscal year before the account closes under section 1552 of title 31 United States Code, to a current Research, Development, Test and Evaluation, Army appropriation account to be used only for the continuation of the Venture Capital Fund demonstration …"

available in FY05 is unclear. Also, language in the FY06 DoD appropriations bill seeks to extend this authority through FY08.[74]

Within FY05, OnPoint, working through a company called "PowerPrecise Solutions" has created a "state of charge" indicator for soldiers' batteries. This is a $5 device that is part of an $80 battery. Under present technology, soldiers throw out batteries fairly casually because their lives may depend on the state of their battery charge. With accurate feedback, the Army hopes to change that culture and save money. Indeed, an Army Audit Agency document reportedly states that this device alone has saved the Army $75 million.[75]

At the present time, and presumably riding on the wave of this positive development, OnPoint is undergoing an internal Army review, but details have not been released. A possible outcome could include an expansion of the OnPoint program, including an expanded investment focus. The expansion would be complementary to present activities. For example, it could grow from the present focus on mobile power for the soldier to tactical power for vehicles. Power support for network communications systems may be another area of focus.

National Aeronautics and Space Administration (NASA)

The FY04 NASA budget provided $5 million for a new approach, known as the Enterprise Engine, to partner with private firms in developing commercial technologies that can directly contribute to the agency's core research activities, while benefiting private industry.[76] NASA has not released much detail about its Enterprise Engine plans. In general, NASA believes it has sufficient statutory authority under the Space Act of 1958 to pursue venture capital activities. NASA is not seeking any additional authority to pursue its VC options. It has management challenges, and needs to place less emphasis on technology transfer (which it calls "spin-out") and more on technology transition (which it calls "spin-in"). Despite ensuing name changes and concept specifics, it still remains valuable to study the early phases of NASA's journey toward a VC activity. For example, a Congressional Research Service (CRS) report describes Enterprise Engine as follows. "The purpose of this activity, according to NASA, is to facilitate 'spin-in' by supporting the development of 'innovative dual-use technologies' as well as to assist industry in the commercialization of these technologies. While NASA notes that this will not be a 'pure venture capital fund,' the agency will invest federal funds in conjunction with private sector financing to support those R&D activities needed to generate new technologies. From the available information it is unclear what this approach entails, but indications are that a mechanism 'similar' to the private sector In-Q-Tel program

[74] H.R. 2863, Section 8102 (109th Congress).

[75] Army Audit Agency report A-2005-0170-ALA, p. 12. (Army Audit Agency reports can be accessed through https://www.aaa.army.mil, but only from computers having a so-called "dot mil" address.)

[76] http://www.whitehouse.gov/omb/budget/fy2004/nasa.html

funded by the Central Intelligence Agency will be created as an 'additional management tool that complements existing programs.'"[77]

At the time that NASA was talking in terms of Enterprise Engine, an undated NASA briefing said that the intent was to remain at the $5 million annual level of activity for the foreseeable future and to gauge success in terms of mission success rather than financial profit from the Engine itself. The Enterprise Engine was a small (but important) part of an overall NASA reorganization. Indeed, soon the President was outlining in greater detail the ambitious space exploration plans he first set forth in his State of the Union address in January 2004.[78] This was followed in June 2004 by the so-called Aldridge Commission report that elaborated on the President's vision for space missions to the Moon, Mars, and beyond, relying in great part by partnerships with the private sector. Specifically, the Commission recommended that NASA consider unique means of reaching nontraditional sources of technology by using approaches similar to the In-Q-Tel program.[79]

A report by the National Academy of Public Administration (NAPA) faulted NASA for a recent decline in its technology transfer efforts "due to organizational changes, budget difficulties, and a lack of program focus."[80] It also commented on Enterprise Engine, highlighting the connection between tech transfer and the planned venture capital activity.

United States Department of Agriculture (USDA)

Among examples of other federally sponsored venture capital activities are the Alternative Agricultural Research and Commercialization Corporation (AARCC) of the Department of Agriculture (USDA). AARCC, as a legal entity, still exists, although it is inactive. The AARCC was established in March 1992, as an independent entity within the USDA.[81]

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[77] Smith, Marcia S., et al. September 23, 2003. "The National Aeronautics and Space Administration's FY2004 Budget Request: Description, Analysis, and Issues for Congress." *Congressional Research Service*, The Library of Congress. Order Code RL31821.

[78] Sietzen, Frank. May 10, 2004. "Exclusive: New Bush space speech planned." *Washington: United Press International*.

[79] Report of the President's Commission on Implementation of United States Space Exploration Policy, "A Journey to Inspire, Innovate, and Discover." June 2004. "Finally, the government's credibility as a partner will also hinge on its commitment to reduce market and regulatory risk, and implement meaningful incentives for private sector investment in space ventures."

[80] "Technology Transfer: Bringing Innovation to NASA and the Nation." November 2004. Panel of the National Academy of Public Administration for the National Aeronautics and Space Administration. August 17, 2005. "The Panel overseeing this Academy study recommends that the NASA Administrator make a stronger leadership commitment to technology transfer by establishing it as a core element of the agency's mission and moving the function to the Administrator's office. The Panel's fundamental conclusion is that technology transfer is destined to fail so long as it is viewed solely as the responsibility of an isolated group of IPP officials." http://www.napawash.org/pubs/nasatechtransferreport12-14-04.htm.

[81] The program was authorized by the Food, Agriculture, Conservation and Trade (FACT) Act of 1990. The Federal Agricultural Improvement and Reform (FAIR) Act of 1996 established AARCC

In Senate testimony in early 1997, the AARCC described the program as follows: "The AARCC is a catalyst for innovation. It is a vital link between the development of high value-added agricultural products and their successful commercialization. It is the only agency in the federal government making equity investments in new, rural business ventures."[82]

The USDA AARCC program also benefited from a provision in the 1996 farm bill which allowed agencies to establish set-asides and preferences for products commercialized with the assistance of AARCC.[83] AARCC companies also were encouraged to use the SBA's Angel Capital Electronic (ACE) network to further leverage its investment.

By late 1999, the USDA Inspector General (IG) issued a report that raised a number of concerns about the AARCC program and the use of AARCC funds by the companies receiving investments.[84]

Congress had already decided not to fund AARCC's operations for FY 2000 and the program's management had decided to cease the corporation's activities. On June 11, 2001, The Federal Register, (Vol. 66, No. 112, page 31107) carried the following announcement: "In fiscal year 2000, Congress provided no appropriation for AARCC. The AARCC Board of Directors subsequently resigned. This delegation of authority authorizes the Under Secretary for Rural Development, or the designee of the Under Secretary, to exercise decision-making authority over AARCC, the AARCC investment portfolio, and the AARCC revolving fund." See, Alternative Agricultural Research and Commercialization Act of 1990, 7 U.S.C. 5901 *et seq*., for more on the AARCC.[85]

The AARCC experiment led to some valuable lessons learned about this type of activity. Sufficient funding, leadership support across the sponsoring organization, a board with experience in due diligence and investment decisions, and a manageable portfolio of companies are all important features. Most importantly, the sponsors need the patience to allow a company to grow and mature; venture capital investments may take years before a judgment can be made about their success.

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as a "corporation" within the USDA, subject to the general supervision and direction of the Secretary of Agriculture.

[82] Crain Bruce W., former Executive Director, AARCC, in a statement before the Senate Subcommittee on Agriculture, Rural Development and Related Agencies. April 15, 1997.

[83] 1996 Farm Bill, Section 729.

[84] USDA. November 1999. Office of Inspector General, Audit Report No. 37099-1-FM, "Assessment of the Alternative Agricultural Research and Commercialization Corporation – Management Lacking Over High Risk Investments."

[85] USDA. January 1999. Office of Inspector General, Audit Report No. 37401-2-FM, "U.S. Department of Agriculture Alternative Agricultural Research and Commercialization Corporation's Financial Statements for Fiscal Year 1997."

Information and Collaboration Model

Navy

The Navy found itself criticized for its "difficulty in transitioning innovative technologies … to active deployment" in a mid-2002 House Appropriations Committee report.[86] Citing an environment of dynamic global economic growth and unparalleled technological advances, the Committee said that the Navy "needs to take a fresh look at how these technological innovations can be rapidly incorporated into Navy systems in all mission areas. Processes modeled after commercial VC practices or the CIA's In-Q-Tel organization should be closely examined to see whether they could be applicable to help the Navy more rapidly introduce innovative technologies into their system acquisition processes."

A response was mandated and the Navy, in a July 2003 report to Congress,[87] articulated several long-terms trends making it "critical that the Department of the Navy improve its ability to identify potentially significant new technologies from commercial sources and to rapidly and efficiently exploit them for use in military systems." The most important long-term trends were:

- Globalization of commerce and technology, making capable weaponry available from a growing number of sources
- The continuing decline of U.S. federal R&D investment as a share of total U.S. R&D activity
- The increasing service life of major DoD weapons systems, at a time when the weapons systems are becoming ever more dependent on commercial components, many of which have short lifecycles

VC activity, however, would only be one form of the Navy's response to their growing realization of the need to exploit commercial trends. As reported to Congress, the Navy's plan included a number of technology innovation and insertion programs.

The Navy conducts its venture capital activities through its Commercial Technology Transition Office (CTTO), an activity of the Office of Naval Research (ONR).

[86] DoD Appropriations Bill, H.R. 5010. House Appropriations Committee Report 107-532. June 25, 2002.

[87] Report to Congress: "Department of the Navy Venture Organization, More Rapid Introduction of Innovative Technologies Into System Acquisition". July 2003. Office of Naval Research and Deputy Assistant Secretary of the Navy (Research, Development, Test, and Evaluation).

The following diagram describes the overall CTTO process:

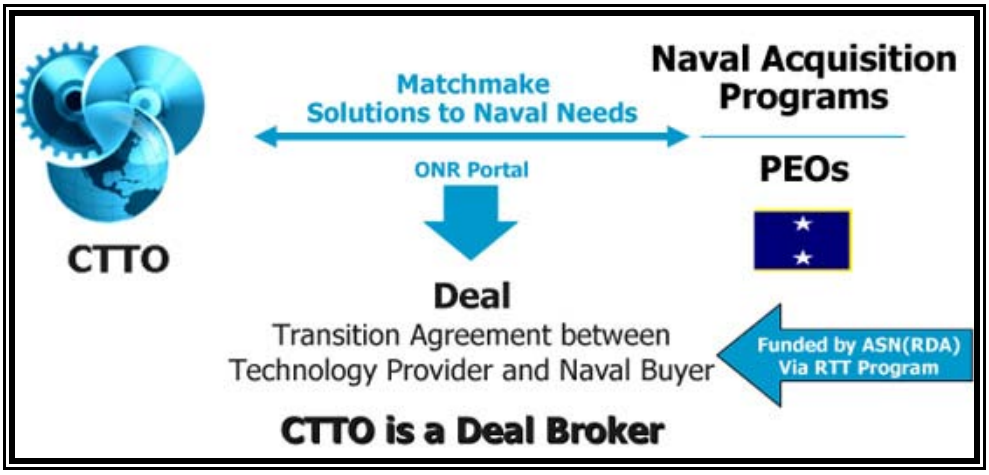

Figure 7: Navy CTTO Process

The Navy makes no direct or indirect equity investments as part of its program.[88] Rather, it engages with the capital marketplace through the resources of its VC Panel and makes selective purchases to test the efficacy of a new idea within Navy operations. As of July 2005, the CTTO office reports that it has done 57 "deals" of this type, consisting of about $212 million in activity, using only about $1 million annually to run the office.

The principal complementary mechanisms the CTTO uses are VCs@Sea, an activity of the Space and Naval Warfare Systems Center (SPAWAR) in conjunction with the CTTO, and the NRAC VC panel, both described below.

The history of how the Navy came to the present state of interaction with the VC community is instructive. The FY2003 House Appropriations Committee (HAC) Report[89] directed the Navy to "examine the benefits of adopting commercial venture capital practices for the more rapid inclusion of cutting edge technologies in major Navy system acquisition programs."

The Navy thereafter conducted several "war games" that allowed it to develop insights on its technology transfer process as well as to get views from the venture capital industry. The session focused on the Navy Venture Initiative concluding that Navy/VC investment opportunities would exist only in niche areas because of different business perspectives (including tolerance for business failure and the time scale for purchase) and because early investment carries high business failure risk, while late investment gains little in product characteristic leverage. The Venture Capitalists (VCps) told the Navy that its money would not materially influence private investment decisions. They recommended that the

[88] CNO Guidance for 2004 articulates a goal to "[d]raft legislation for establishing an Enterprise Fund (Venture Capital Fund) for unfettered investment in promising new technologies. (OPNAV N4 lead, OLA)." However, discussion with CTTO members evidenced no present intent to pursue this path, but instead, to seek modification of the CNO Guidance.

[89] Rpt. 107-532, June 25, 2002, p. 6.

key areas of interaction should be through information exchange, with VCps giving the Navy insight into investment areas that signified future product capabilities. The Navy could provide the VCps insights into the emerging Navy market by articulating its future needs.[90]

VCs@Sea

The Navy also created the VCs@Sea program which provides VCs the opportunity to visit operational platforms such as aircraft carriers to learn first hand the Navy's needs as well as witness life at sea. The intent of the program is to permit the VCs to experience the Navy's "pain points" and possibly even identify technology gaps that might not yet be recognized.

On the basis of its first VCs@Sea event, conducted with VCps who would later become the first members of the NRAC VC Panel, 124 portfolio companies were identified as being able to provide potential improvements. Of that number, the Navy adopted approximately 5 technology product solutions for use.

NRAC VC Panel

The Navy's response to the HAC contained the following major conclusions on VC engagement that were consistent with the Navy's decision to create a VC panel within the NRAC, which began operations in early 2004:

> The greatest value to the Navy will be in early awareness of emerging commercial technology trends. Venture capitalists can provide awareness in a few areas, which, although they do not address all naval needs, are critical; and relationship with the Navy is of interest to venture capitalists for reasons beyond funding.[91]

The Terms of Reference for the VC Panel state that the panel is "aimed towards establishing a dialogue with the venture capital community to gain early awareness of emerging trends in critical high technology areas such as information technology, advanced microelectronics and photonics, wireless networking, and biotech."

The specific tasking for the panel is to "examine current approaches to technology development and transition within the Navy and compare them to commercial approaches." Under this, the NRAC panel is engaged to:

- Review the Navy and Marine Corps technology development plans in mission critical areas (e.g., information technology, communications, logistics, etc.) and provide feedback on ways to more closely align those plans with emerging trends that panel members identify within commercial sectors.

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[90] Briefing slides, "Navy Venture Initiative Wargame," undated.

[91] John J. Young, Jr., ASN (RD&A). July 16, 2003. Letter to various House and Senate Committee Chairs, transmitting Report to Congress: Department of the Navy Venture Organization, "More Rapid Introduction of Innovative Technologies Into System Acquisition."

- Identify emerging commercial sector technologies for potential use by the Navy and Marine Corps. These technologies might be broad trends where the Navy can benefit from an early awareness, or it might be specific technologies that provide disruptive advances.
- Review technologies within the naval research enterprise that are considered particularly valuable and potentially of commercial interest. Recommend paths to make these technologies available to the commercial sector quicker and for the benefit of the nation/Navy/Marine Corps.[92]

The NRAC VC Panel is constituted under procedures making it compliant with the Federal Advisory Committee Act.[93] The chairman of the panel, a venture capitalist, is the lone statutory member of the NRAC.[94] The head of the CTTO acts as the executive secretary of the VC panel.[95] The remaining 8 venture capitalists serve as technical advisors.[96] Panel members agree to serve for a 2-year term. The CTTO office believes it will cost approximately $125,000 annually to operate the VC Panel.[97]

Since this is a relatively new process, with the first formal meeting of the panel occurring in March 2004, few facts can be reported on the operation of the Panel itself except that it took upon itself to write a report outlining findings regarding the use of the venture capital community.[98] If the first official meeting becomes typical, the meetings will consist of familiarization briefings and tours as well as discussion of Urgent Need Statements (UNS) previously assembled by polling the Navy Program Executive Officers (PEOs).[99]

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[92] Terms of Reference, Venture Capital Technology Panel, undated, unsigned, as distributed to the Panel members, March 17, 2004.

[93] The Federal Advisory Committee Act generally requires open meeting and the publications of minutes. Compliance allows the government to accept consolidated recommendations of the panel.

[94] The current Chairman of the NRAC VC panel is Mark Lister, Managing Director, Rosettex Technology and Ventures Group. In August 2005, Lister was selected to chair the entire NRAC in addition to his duties as the panel chair.

[95] The NRAC was created in 1946. It is an independent civilian scientific advisory group which provides analyses in the areas of science, research and development. By law its membership is limited to fifteen individuals. For more detail, see http://www.onr.navy.mil/nrac/default.asp. However, even as late as mid-August 2005, there is nothing on the NRAC Website that suggests the existence of the VC panel, or is any of its work made public there. A briefing explaining the VC panel's operation, as well as the Terms of Reference for its operation, are available at the Navy's CTTO Website, http://www.onr.navy.mil/ctto/nrac.asp, (viewed 17 August 2005).

[96] The VCs are designated as Special Government Employees.

[97] Panel members are compensated for travel and per diem. The current plan is to hold Panel meetings quarterly at locations consistent with the intended agenda while minimizing travel expenditures.

[98] As of mid-August 2005, the report of the NRAC VC panel has not yet been made final. However, preliminary reports indicate that the panel has concluded that Government equity (i.e., investment) dollars are not required to successfully employ the unique capabilities of the private venture capital marketplace.

[99] The Panel's agenda at its March 2004 meeting included briefings on Composable FORCEnet, PEO (C4I and Space), Sea Based Battle Lab, Marine Corps Tactical Systems Support Activity, Special Operations Mission Support Center, as well as an orientation briefing by the host organization, the SPAWAR Systems Center, San Diego, CA. Later, the Panel was provided a handout labeled "Urgent UNS Status," the acronym UNS being identified as an Urgent Need

Process, alone, is not sufficient, however. The Navy feels that the course of action it is following "extracts the greatest possible value from the venture capital community and has the additional advantage that it can be put into place quickly.[100] Just as is the case with In-Q-Tel, however, effecting transition of technology or awareness into naval acquisition programs requires personnel with business skills as well as technical expertise, who are able to communicate effectively with acquisition professionals and empowered to negotiate with them."[101]

Department of Defense

DoD's recognition of unmet R&D needs and interest in using venture capital methodologies can be traced back to at least December 2000. In a DoD news briefing, the then Deputy Under Secretary of Defense for Acquisition Reform Stan Soloway appeared as a panelist with, among others, Bob Bartolini, Vice President of the Sarnoff Corporation.[102] Soloway said "…the problem we face … is a communications and collaborative one. Typically, we're not at the table with companies that are doing cutting-edge R&D, helping them understand our needs, our obsolescence concerns, our long-term sort of military outlook and so forth. And that means as technology develops, we're kind of just jumping over trying to figure out if we can use it rather than being, like other customers in the marketplace, a partner at the table, figuring out and having some input into where that technology development goes."[103]

If Soloway was clear about the problem, he was not prepared to commit to VC activity, saying instead that it's "not inconceivable that DoD would think about doing something like In-Q-Tel, but at this point, there's been no policy-level discussions of it…."[104]

Statement. The list was eclectic in its technology areas and ranged from the sophisticated to the mundane (e.g., mosquito bed netting).

[100] On July 22, 2005, Admiral Mike Mullen relieved Admiral Vern Clark as the Chief of Naval Operations (CNO). Although likely to follow much of the stellar work of the much-admired Adm. Clark, Mullen has caused a sweeping review of Navy needs. This may affect the Navy's approach to venture capital. One thing seems clear: the new CNO recognizes that prudent planning and keeping the confidence of Congress depends in no small part on requirements planning. *See*, Cavas, Christopher P. August 15, 2005. "New USN Chief Sets Tight Deadlines for Studies." *Defense News*, p. 12. In a memo shortly after assuming command ordering a review of OPNAV, Adm. Mullen wrote: "Please ensure that your review incorporates the establishment (or re-establishment as the case may be) of a REQUIREMENTS BOARD as well as a Ships Configuration Board."

[101] Report to Congress: "Department of the Navy Venture Organization, More Rapid Introduction of Innovative Technologies Into System Acquisition." July 2003. Office of Naval Research and Deputy Assistant Secretary of the Navy (Research, Development, Test, and Evaluation), p. 8.

[102] The briefing was broadcast from the Pentagon on December 15, 2000 to an audience at Ft. Belvoir. The Sarnoff Corporation went on to engage in a joint venture with SRI to form Rosettex, a for-profit VC that serves the National Geospatial-Intelligence Agency (NGA), formerly NIMA.

[103] Ibid.

[104] Ibid.

Activities progressed and, in July 2002, DoD's newly created Office of Force Transformation (OFT) was devoting significant energy to considering venturing methods. OFT personnel recognized the diversity of VC models, grouping them as traditional (i.e., profit only) VCs, angel investors, nonprofit (e.g., government-affiliated) VCs, and corporate entities. OFT members also identified resistance to the DoD's use of VC processes, which they listed, in part, as follows:

- The Defense Advanced Research Projects Agency (DARPA) and the Small Business Innovative Research (SBIR) program are the DoD's venture capitalist equivalents—let's fix them.
- DoD will bear all costs to spur ignored technology sectors.
- Experimenting with prototypes is meaningless without program manager and prime contractor buy-in.
- VCs cannot commercialize a "big jump," or disruptive technology.
- Too many innovations are already not being used; why create more?
- DoD would be competing with existing VCs for deals.
- The CIA's experiment in In-Q-Tel is not proven; it will not make a difference and, in any event, isn't scalable to DoD.
- Post-9/11 is the wrong time to transfer technology to the private sector.[105]

Of these criticisms, the OFT staff found 2 reasons most compelling: the nature of DoD's potential foray into ignored technology sectors and the improbability of commercializing what they termed disruptive technology. As to the first criticism, they concluded that DoD would have to be careful not to use the VC methodology in completely improbable commercial areas (e.g., nuclear). As to the second, the staff believed that disruptive technologies are not favored by VCs, as these capital market players look for deals with large market appeal, with a clear and short connection to large sales. Still, the OFT members concluded, this very tendency makes VCs a potentially valuable resource for discovering interesting technology solutions to DoD's problems—by looking at the very deals that the VCs reject. While these technologies may not yield successful investment candidates, they may be suitable for DoD support in some other way.

Concluding that, on balance, there was a need to move ahead, OFT characterized 3 general thrusts of potential DoD VC activity:

- The establishment of a DoD VC fund, in the manner of CIA's In-Q-Tel
- The establishment of stronger ties to the VC community
- The establishment of a corporate VC model, focused on spinning out DoD technologies at a greater rate, thereby creating greater rewards for DoD scientists and engineers, and spurring on even more innovation within the government laboratories

The parallels between the DoD and industry, and therefore the use of the corporate VC model by the DoD in other ways, continued to command interest.

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[105] Lewis, Mark. July 2002. DoD Office of Force Transformation. "Venture Capital Options for DoD."

The Office of the Deputy Under Secretary of Defense for S&T (ODUSD[S&T]) commissioned activity under a task entitled "Engaging the Venture Capital Community." The work was conducted by the Institute for Defense Analyses (IDA) of Alexandria, VA and included a workshop in November 2002 and a report which issued in March 2003.[106]

The IDA study identified the problem as twofold: "the Defense Department does not have ready access to innovative technologies available from nontraditional sources; and DoD has great difficulty transitioning innovations into use."[107] The IDA-led work suggested a process that would perform the following functions:

1. **TechFinder and Transition Support.** Brokering functions to aggressively identify nontraditional sources and match them with user needs coupled with transition support to provide funds to foster the application of commercial solutions "through active support for experimentation by users, recurring test and evaluation, and seed funding to DoD users and customers."

2. **Fostering Commercial Solutions.** Augmenting the brokering functions with a "DoD-sponsored external commercial technology center would seek to identify potentially useful technologies in the earliest stages and provide resources to accelerate and influence their development for eventual DoD customers."[108] This idea has not been officially embraced within any part of DoD except for the Army, whose activities were the result of other factors.

The DoD's venture capital activity began taking form in late-2002 around an informally adopted name, Defense Venture Catalyst Initiative or DeVenCI.[109] Early activity was conducted through the DoD's OFT. Research in that office led to an event called Advanced Technology Showcase (ATS), which was held in Irvine, CA on October 28-29, 2002. It was conducted by the Tech Coast Angels (TCA), a group calling itself the largest and most active association of angel investors in the country.[110] Literature from that meeting referred to the event as "DoD's 'Venture Capital Business Practice Experiment.'" The goal was

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[106] Graham, David. R., et al. March 2003. "Defense Venturing Process: A Model for Engaging Venture Capitalists and Innovative Emerging Companies." *Institute for Defense Analyses*. Alexandria, VA

[107] Ibid.

[108] Ibid.

[109] A recent article describes the genesis of DoD's venture capital activity as being purposefully unlike CIA's In-Q-Tel. *See*, August 8, 2005. "In-Q-Tel: The CIA's Silicon Valley Bridge." *Red Herring.* Viewed at http://www.redherring.com on 17 Aug 2005. "Shortly after September 11, 2001, U.S. Secretary of Defense Donald Rumsfeld summoned a group of venture capitalists, techies, and high-finance types to the Pentagon. He wanted to talk about ways to deliver new technologies into the fight on terror. Fast. The scheme hatched in that meeting was to start a pilot program designed to match venture capital and startups to specific problems the U.S. Department of Defense wasn't solving. With VCs such as Wilber James from Rockport Partners, Ted Schlein from Kleiner Perkins, and John Kasich, a former U.S. Congressman and a partner at Lehman Brothers, in Mr. Rumsfeld's office that day, it is likely that the participants already had a model in mind that would solve the problem. But knowing Mr. Rumsfeld's hostility toward a certain government agency, it may be no surprise that it didn't come up."

[110] See http://www.techcoastangels.com as well as discussion in Chapter Four.

described as attempting "to create a new business process in the DoD that can be reproduced regionally and scaled for different functional areas. The process would use the venture capital community as *technology finders* for the DoD."[111] [Emphasis in original.]

The TCA looked at the experiment as a model with significant promise. In their view, "it would take a thousand VC firms to equal the networking power of TCA's 200 members. TCA, which invests on average $700,000 per venture and $50,000 annually per member, can focus on seed and early-stage. VC funds, with far fewer partners and larger capital to deploy, need to be … [later] in the deal flow. The ATS model couples the networking power of TCA with the capital strength of its 24 VC Affiliates."[112]

The TCA event was a success in that it demonstrated a promising process. The Tech Coast Angels were able to gather submissions from leading institutional VCs, corporate VC arms, angel groups, as well as leading regional universities. The resulting list of 85 technologies was then circulated by OFT among the heads of DoD agencies and Service labs. The summaries considered most interesting, based on this polling, were then requested to brief at the Irvine, CA event. While parallels could be drawn to earlier activity by the DoE, this represented an interesting beginning for DoD.[113]

DeVenCI activities for the DoD have been led from the office of Dr. Steven King, Director of the DeVenCI. King is assigned to the Office of the Deputy Under Secretary of Defense (S&T). Currently, Dr. King reports that DeVenCI, has ended as an experimental program, but work is underway to secure its approval as a formal program.[114]

The following DeVenCI slide (Figure 8) shows the DeVenCI process as it was pursued during the experimental phase of the program and how it would likely continue if formalized.[115]

DeVenCI does not make direct investments. Its vision is, in partnership with VCs, to engage the emerging commercial technology community to address DoD operational challenges. The stated goals of the program are to:

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[111] Ibid. Use of the term "technology finders" is similar to DoD's term "technology scouts," signaling a focus behind the activity of bringing technology into the organization.

[112] Ibid. TCA members are required to participate in at least two deals annually at unspecified levels.

[113] The Advanced Technology Showcase can be distinguished from mere technology forums because of its significantly greater focus on creating interaction with the capital markets community of VCs, angels, and so forth. That is not to say that events such as those conducted by DARPA (e.g., DARPATech 2004) could not satisfy many of the same goals, if marketed differently.

[114] Email exchange with Dr. Steven King, July 25, 2005.

[115] Although hard facts on the program remain elusive, there is no indication that the formalization of the program will fail. Accordingly, subsequent references to DeVenCI operations will continue in the present tense.

- Leverage VC insight and access to emerging technology companies and experts.
- Broker relationships between innovative companies and DoD customers.
- Solve short term (e.g., 6 to 18 month) challenges related to the Global War on Terrorism and the security of [DoD's] Net-Centric Operations.

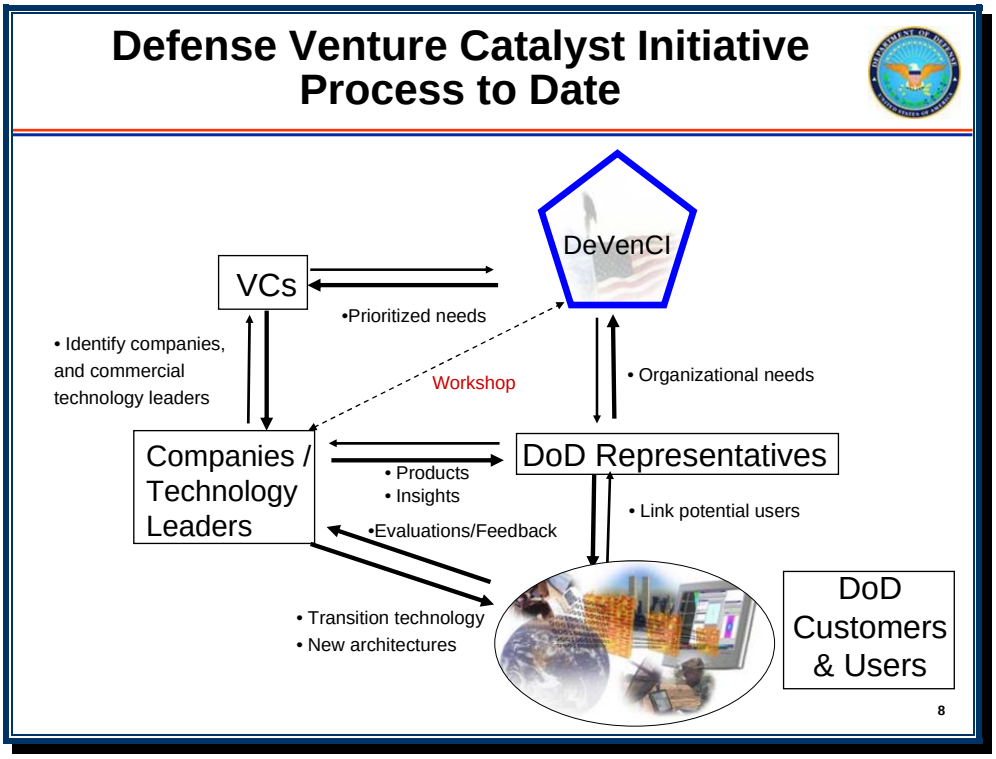

Figure 8: DeVenCI Process under the Experimental Program

DeVenCI claimed 13 successful technology transitions, with another 10 under evaluation as of mid-2004.[116] They believe these have made a significant contribution to the war on terrorism, improved cyber operational security, and resulted in significant improvement in search capabilities of unstructured databases. "DeVenCI has promoted DOD's adoption of commercial best practices (such as establishing Internet Demilitarized Zones for external Web services); injected products that meet specific, near-term DoD needs (such as new high-speed firewalls); and exerted influence over early-stage commercial developments (such as policy-based security approaches)."[117]

[116] April 23, 2004. Telephone conference call with Dr. Steven King.

[117] December 2004. *Aerospace America*, p. 50.

Technology Transfer Model

Department of Energy

Many lessons can be learned from the Department of Energy (DoE), which has a complex contractor support network and has been reaching out to venture capitalists for quite some time.

Understanding the background of the relationships is helpful. The Sandia National Laboratories of the DoE's National Nuclear Security Administration (NNSA), at Kirtland Air Force Base, are managed and operated by the Lockheed Martin (LM) Corporation subsidiary, the Sandia Corporation. The Sandia Corporation (a FFRDC) operates the facility as a GOCO).

When the Management and Operation (M&O) contract for Sandia was solicited years ago, the predecessor of LM, Martin Marietta Corporation, proposed contributing $1 million of its fee annually to create and support a not-for-profit entity that would perform technology transfer activities for the Sandia site. The entity that was created is the Technology Ventures Corporation (TVC), a nonprofit subsidiary of LM. The Sandia Corporation M&O agreement, a $2.2 billion contract generating about a $15 million fee, results in a LM contribution of approximately $1.9 million (currently) to fund the activities of TVC. An additional $1 million is provided annually through a contract between NNSA and TVC for its support of locations (Lawrence Livermore, Los Alamos, and the Nevada Test Site) that were not covered under the original Martin Marietta commitment.

TVC has conducted 12 annual Equity Capital Symposium events in Albuquerque since the start in 1993. These events are technology "American Idol"-like events where hopeful investees, using DoE lab technologies, can vie for the privilege of presenting their ideas and business plans to venture capitalists. Only the best 15 chosen by TVC are allowed to present, so the competition gets fierce, and quality is high. The TVC process screens for commercially sound ideas—no "sonic mousetraps" is their way of putting it. TVC, therefore, acts as both preliminary judge and mentor, all to help the entrepreneur develop a credible business case.

Some of the training for the entrepreneurs is provided by the Center for Commercialization and Training, the education and training arm of the TVC, in partnership with the NNSA. Workshops are free to participants. Since its inception, more than 4,650 individuals have passed through the series of workshops.[118]

When ready to introduce the idea to the world, the entrepreneur/investee gets to compete with the other candidates for a place in the Symposium. No fee is charged to either the entrepreneur or to the VC in attendance.

[118] August/September 2005. "But What Does TVC Actually Do?" *TechComm*, p. 39.

About 30% of the entrepreneurs receive funding as a result of this process. Over the past 11 years of activity, TVC estimates that it has attracted $516 million in venture capital money for its client pool, and has led to the creation of some 68 new companies creating 6260 new jobs.[119] Also, not all deals involve equity investments; other arrangements, more difficult to quantify, involve collaboration with firms such as Texas Instruments, Intel, and 3M.

TVC also publishes TechComm: The National Journal of Technology Commercialization,[120] a bimonthly magazine that is distributed without subscription charge. It has a circulation of more than 11,000. TechComm aims to highlight the many technology accomplishments at NNSA facilities and support and encourage their commercialization. The magazine began publication in late 2003 and reports on new ideas, patents, people, and upcoming activities, straddling the disparate worlds of business and technology. It also fosters the growth of a more effective entrepreneurial culture within NNSA laboratories and thus supports TVC's more familiar role, the producer of annual technology expositions.

TVC has also been the lead in establishing the New Mexico Technology Research Collaborative (TRC).[121] TRC's goal is to promote closer relationships among the state's national laboratories, research institutions, and universities. The TRC collaborates accelerating new technology business formations that benefit research programs of TRC members, entrepreneurs, industry, investors, and the State of New Mexico. For example, it aims to facilitate the marketing of complementary intellectual property (IP) bundles, by showcasing the IP that composes its member's portfolios.

TVC has also begun publishing a magazine for TRC (called TRC), but it is not yet available on the Web. It, too, is a free subscription.[122] TRC (the magazine) highlights the 6 proposed Advanced Technology Centers that will be operated by the University of New Mexico, New Mexico Tech, or New Mexico State University in collaboration with one or more of the national laboratories and other research organizations.[123]

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[119] August 18, 2005. TVC. http://www.techventures.org/NewMenuTechVentures/TVCHome/about.htm.

[120] http://www.techcommjournal.org.

[121] http://www.nm-trc.org.

[122] The first issue of TRC was the Winter 2005 edition.

[123] In 1983, the New Mexico legislature funded five Centers of Technical Excellence for $30.9 million. The state funds were leveraged into federal and private investments totaling some $286 million. TRC is now seeking $42 million over a five-year period as seed money to fund a total of six Centers. See, Winter 2005. *TRC*, pg. 4.

The success of the New Mexico program undoubtedly led to the TVC's expansion to the California Lawrence Livermore site, including the conduct of a symposium in California patterned after the original New Mexico event.

However there is still more to learn from DoE and its contractor affiliations. For example, Battelle, one of the M&O-contractor co-venturers at DoE's Oak Ridge National Laboratory, embarked on a privately funded technology transfer program through the creation, in August 2003, of Battelle Ventures, L.P.[124] This is particularly interesting since the program has parallels to a program started there in the early 1980s by the previous M&O contractor, Martin Marietta. That initiative lost money and was criticized as having irreconcilable conflicts of interest. So, it remains to be seen whether Battelle can improve on it. If successful, DoE would have TVC reaching out to the venture community through communicative processes and Battelle leading private investment in DoE technologies through its newly established Battelle Ventures, capitalized at reportedly $150 million.[125]

Both the TVC and Battelle stories involve support for technology transfer, although the focus of TVC's mission is job creation. The lessons and example of the DoE can be applied productively to the DHS because the common thread is the matching of technology to market needs, with the aid of entrepreneurs acting in their self interest to create useful products.

Financial Risk Underwriting Model

Small Business Administration

SBA, counsels, assists, and protects the interests of small business concerns, and advocates on their behalf within the government.[126]

The Homeland Security Act of 2002 requires the head of each executive agency to "conduct market research on an ongoing basis to identify effectively the capabilities, including the capabilities of small businesses and new entrants into federal contracting, that are available in the marketplace for meeting the requirements of … defense against or recovery from terrorism or nuclear, biological, chemical, or radiological attack."[127] This legislative language sets the

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[124] "Venture Fund Hopes to See Profitable Ideas Emerging from Tennessee Laboratory." *The Miami Herald*. March 31, 2004. http://www.miami.com/mld/miamiherald/business/national/8323552.htm. The M&O contract at Oak Ridge involves a joint venture of the University of Tennessee (UT) and Battelle.

[125] The Battelle Ventures Website states that their fund is seeking to invest in technology companies within the following five key areas: Life Sciences, Information Technology, Homeland Security, Energy, and Advanced Materials and Nanotechnology. "Battelle Ventures enhances and adds value to its portfolio companies by leveraging the technologies and expertise of Battelle Memorial Institute and the National Laboratories it manages or co-manages for the U.S. Department of Energy." August 18, 2005. http://www.battelleventures.com.

[126] 13 C.F.R. 101.100.

[127] Section 858, P.L. 107-296, Nov. 25, 2002, 116 Stat. 2135 at 2238. The Section goes on to state: "The head of the executive agency shall, to the maximum extent practicable, take advantage of

stage for SBA to conduct programs that assist the DHS directly in identifying small businesses that may be particularly helpful in providing solutions in the defense of the nation.

In the venture capital arena, the SBA contributes to the VC ecosystem through several of its programs. For example, the SBA manages the Small Business Development Centers (SBDC) program. "The SBDC program creates a broad-based system of assistance for the small business community by linking the resources of federal, state, and local governments with the resources of the educational community and the private sector. Although SBA is responsible for the general management and oversight of the SBDC Program, a partnership exists between SBA and the recipient organization for the delivery of assistance to the small business community."[128] Entities applying to operate a local SBDC submit proposals outlining their projected activities and must be prepared to meet SBA's "Cash Match" rules. They must provide funds that at least equal the federal contribution, after covering indirect costs, overhead costs, or in-kind contributions. The aim of the SBDC network is to provide small business people and entities with counseling, training, and specialized services, concerning the formation, financing, management, and operation of small business enterprises, using primarily institutions of higher education.

Another SBA program contributing indirectly to the venture capital ecosystem is the Program for Investment in Microentrepreneurs (PRIME). "PRIME authorizes SBA to make grants to 'qualified organizations' to fund training and technical assistance for disadvantaged entrepreneurs, build these organizations' own capacity to give training and technical assistance, fund R&D of 'best practices' in microenterprise development and technical assistance programs for disadvantaged microentrepreneurs, and to fund other undertakings the Administrator or designee deems consistent with these purposes."[129]

The Small Business Investment Companies (SBIC) program is probably the most high profile of the SBA-run programs.[130] It was created in 1958 to provide venture capital to small businesses in start-up and growth situations. Small

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commercially available market research methods, including use of commercial databases, to carry out the research."

[128] 13 C.F.R. 130.100.

[129] 13 C.F.R. 119.1.

[130] High profile also invites criticism. Some critics object to virtually any government involvement to assist business, on the theory that government distorts the pure mechanisms of capitalism. *See*, for example, Ashby, Barry, Washington Editor. March 2005. "Uncle Sam … venture capitalist." *Business and Industry, Industrial Heating*, Vol. 72, No. 3, pg. 12: "Whether it is a captive VC fund run by CIA or contractor operated as with Army, there is no justification for government to be in the VC business. VCs use public money to compete with private sector lending and investing…. Encouragement by government to seek money with less hassle is not good for America. The prime culprit is the Small Business Administration's (SBA) Small Business Investment Company (SBIC), the primary licensed lenders of government funds injected into SBIC pools of private capital. …. It is a short step from equity investing to management control in the private sector, and governments should do neither."

businesses that qualify for assistance from the SBIC program are able to receive equity capital, long-term loans, and management assistance. Venture capitalists participating in the SBIC program can supplement their own private investment capital with funds borrowed at favorable rates through the federal government.

At the end of FY2003, the SBA had close to $5.5 billion invested in 435 funds, plus another $3.7 billion in available commitments. SBA investment is leveraged with private capital exceeding $12 billion giving the program a $21 billion impact of available equity capital for entrepreneurs.[131]

SBIC operates as a "fund of funds," which means that portfolio management and investment decisions are left to the individual fund managers. The SBA has very minimal direct involvement in a chartered SBIC's portfolio management operations. The individual funds are for-profit investment companies that are licensed by the SBA.[132]

To become licensed, the private equity managers must secure minimum commitments from private investors of either $5 million (for a debenture fund) or $10 million (for an equity fund). For every $10 million in private equity, SBIC licensees are eligible to receive up to a $20 million SBA commitment (2:1 public-private leverage), substantially increasing prospective portfolio returns. The total size of an SBIC typically ranges from $30 million to $170 million. The SBA becomes a preferred limited partner when equity investments are made, meaning that it is entitled to received a preferred return (referred to as the "prioritized payment") prior to any distributions being made to private general and limited partners. The amount of SBA's profit participation is calculated using 2 factors: the 10-year Treasury bond rate and the ratio of SBA's participating securities to private capital.

SBICs may only invest in "small businesses," defined as entities having a net worth less than $18 million and prior 2 years' average after-tax income less than $6 million. SBA's commitments are of limited duration so that exit strategies in excess of this timeline are not suitable for the program. An SBIC is permitted to control, either directly or indirectly, a small business for a maximum period of 7 years, absent SBA approval of special conditions.

"The New Markets Venture Capital (NMVC) Program is a developmental VC program for the purpose of promoting economic development and the creation of wealth and job opportunities in low-income geographic areas and among individuals living in such areas. SBA selects and then enters into participation agreements with selected newly formed VC companies, and provides leverage in the form of debenture guarantees to these companies to allow them to make equity capital investments in smaller enterprises located in low-income geographic areas. SBA also awards grants to such companies and to Specialized

[131] *See,* August 5, 2005. SBA Website at http://www.sba.gov/INV/.
[132] Ibid.

Small Investment Companies so that they can provide operational assistance to such smaller enterprises in connection with such investments."[133]

The bottom line to these SBA programs is that their aim is job creation through wealth creation. They are not focused on a particular technology, nor are they able to control the investment decisions. SBIC and NMVC each represent a fund of funds approach.

The principal contribution of the SBA programs is in making marginal deals better because of the support of the SBA. In lowering the bar on risk, they can serve more investees, but in so doing, some poor deals undoubtedly get funded.

Other Federal Approaches to Funding Technology Innovation

CIA, Army, and Navy VC programs were not the only developments leading to the evolving perception that venture activities could provide some useful results for federal agencies. The Department of Commerce has been funding studies that were providing supporting information.[134]

The Advanced Technology Program. ATP is administered by the National Institute of Standards and Technology in the Department of Commerce. ATP funds on a cost-share basis competitively selected proposals for early-stage, innovative technology development. Since its inception in 1990, ATP has awarded over $2.2 B to 768 applicants, with an equivalent investment by the awardee or its partners.[135]

An ATP study in 2002 identified some issues for analysis:

1. What is the distribution of funding for early-stage technology development across different institutional categories? How do government programs compare with private sources in terms of magnitude?
2. What kinds of difficulties do firms face when attempting to find funding for early-stage, high-risk R&D projects? To what extent are such difficulties due to structural barriers or market failures?[136]

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[133] 13 C.F.R. 108.10.

[134] Two excellent background resources dealing with federal laboratory policies and the challenge of commercialization were recently published by the Department of Commerce: Reamer, Andrew, et al. 2003. *Technology Transfer and Commercialization: Their Role in Economic Development*; and, Palmintera, Diane, et al. 2003. *Partners on a Mission: Federal Laboratory Practices Contributing to Economic Development.*

[135] http://www.atp.nist.gov/eao/statistics.htm.

[136] Branscomb, L. M. and P. E. Auerswald. November 2002. *Between Invention and Innovation: An Analysis of Funding for Early-Stage Technology Development.* Economic Assessment Office, Advanced Technology Program, National Institute of Standards and Technology, Department of Commerce.

The 2002 Department of Commerce study (see footnote above) found that "most funding for technology development in the phase between invention and innovation comes from individual private-equity 'angel' investors, corporations, and the federal government— not venture capitalists." While not surprising, the study findings reinforce the need for flexibility in approach to the capital markets by governmental venturing activities. Capital markets are not monolithic. Rather, markets respond to proposed deals based on their technology readiness and market positioning that is familiar to the funding partner. In effect, the dealmaker is matching a potential entrepreneur with a potential funding source, both reacting to a perceived market.

Whether the ATP program will survive remains to be seen.[137] One of the reforms suggested to head off its demise is to ensure that the program does not fund product development and marketing.[138] This domain is seen as improper for government by critics. However, the aim of some of the emerging USG VC programs is certainly product development and marketing. The difference between an USG VC investment and private VC investment is that there is hopefully a rational relationship between the support and a definite agency need (e.g., the funding of an Arab-language translation software by the CIA). The ATP's woes, therefore, illuminate the need to strike the right balance of VC investment for the USG mission without being viewed as a provider of funds for special interests.

United States Air Force. Air Force Research Lab (AFRL) sponsored a study in late-2003 to compare the various VC activities that were emerging in the federal sector. The study was completed and publicly released in May 2004. It proposed several models for possible adoption by AFRL in support of its Air Force mission.[139] These alternatives included waiting, engaging with the VC community similar to DeVenCI or the Navy without taking any direct equity investments, or copying the In-Q-Tel model virtually in its entirety. The latter option needs additional statutory authority.

One of the points made in the Air Force study was that under any type of VC activity, existing technology transfer and technology transition mechanisms needed to be well understood and fully optimized.

The report recognized that the Air Force already has an extensive investment in a requirements-defining process, the result of the distillation that occurs within the concept of operations (CONOPS) and capabilities review and risk assessment (CRRA) process. Also, in 1999, the Air Force Materiel Command (AFMC)

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[137] The program is controversial. The Bush administration is proposing to eliminate the ATP program in the FY06 budget. The same threat loomed in FY05, but the ATP was funded then to a level of approximately $140 million to continue ongoing projects, but not start new ones.

[138] U.S. Department of Commerce. February 2002. *The Advanced Technology Program: Reform with a Purpose*, p. 3.

[139] Chachula, Bernard M. May 14, 2004. "Evaluate Initiation of an Air Force Venture Capital Fund." Wright Brothers Institute, 5100 Springfield Pike, Suite 500, Dayton, OH 45431; Report WBI-2004-1.

established the Applied Technology Council (ATC) process, envisioned to tie together the viewpoints of the user, laboratory, and program office communities. The ATC process is specifically aimed at facilitating the transition of technology projects to the warfighter.[140] The report observed that these existing tools may be parts of the process of problem-set generation ultimately working with the VC players.

The report also observed that the Air Force also has its Scientific Advisory Board (SAB): a body established to provide independent technical advice to USAF leadership. It could be used in a fashion similar to that of the Navy's use of the NRAC VC Panel.[141] Departing from the Navy model, the report recommended that the Air Force would broaden its view if the approach taken extended beyond the use of large VCs. Buy-in by the SAB would be required for this new role, but in the end that would undoubtedly make the VC process enjoy greater acceptance within the Air Force.

To date, no decision has been made on the use of VC tools by the Air Force. At the AFRL, in particular, a great deal of energy and focus are being placed on the Base Realignment and Closure (BRAC) process as well as internal transformation. The jury is still out; perhaps a newly formed DeVenCI will clarify matters as it gives more direction to military-run initiatives.

[140] The Applied Technology Council concept figures prominently in a recently published DoD Inspector General Report. *See*, DoD Office of the Inspector General. September 12, 2003. "Air Force Transition of Advanced Technology Programs to Military Applications." Report D-2003-132. Downloadable at http://www.dodig.osd.mil/audit/reports/fy03/03-132.pdf.

[141] The Scientific Advisory Board is governed by Air Force Instruction 36-110, 1 June 1998. Board activities are overseen by a steering committee which considers and approves requests for Board assistance. *See*, http://www.e-publishing.af.mil/pubfiles/af/36/afi36-110/afi36-110.pdf.

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CHAPTER 3: DHS STAKEHOLDER OPINION ABOUT GOVERNMENT VENTURE CAPITAL CONCEPTS

The HSI study team interviewed 15 authoritative senior staff and substantive experts from a cross-section of DHS offices and components. These individuals were selected because they are involved with technology decisions at DHS. The team asked their opinions about new technology acquisition, views on barriers to adoption of new technologies, and opinions on a USG VC concept for DHS.[142]

One of the early findings of our study is that although all interviewees were subject matter experts in their DHS office or component, only a handful knew anything about venture capital or the USG VC models. Therefore, some opinions documented in our report may be based on incorrect facts or misperceptions. However, the common misperceptions in our interviews can give DHS leadership clues about groundwork that may need to be done with DHS staff before rolling out a DHS VC model.

Another notable feature of DHS stakeholder opinion on USG VC concepts is how diverse it is. Some stakeholders strongly supported the USG VC concept for DHS; others just as strongly rejected it. In this section of the report, for each favorable argument for a USG VC, another stakeholder presented a similar one against the idea. Therefore, it is important to note the 2 things that DHS stakeholders all agreed on:

1. How new technology for DHS end users needs multiple paths for quick development
2. How the CIA compares to the DHS

[142] The DHS team interviewed 15 DHS stakeholders from July through September 2005. Interviews were done with staff from each office in DHS S&T (Plans, Programs and Requirements, Office of Research and Development, Homeland Security Advanced Projects Agency and Systems and Engineering Development). We also interviewed stakeholders from the Domestic Nuclear Detection Office and the Office of State and Local Government Coordination and Preparedness. We spoke with at least one representative from many of the DHS components, such as Transportation Security Agency, Border and Transportation Security, Federal Emergency Management Agency, US Secret Service, US Coast Guard, and Immigration and Custom Enforcement. See Appendix 1 for more information on the semi-structured interview process and research design.

Opinions Commonly Held in the DHS Stakeholder Interviews

One common opinion came through in each of the 15 interviews: DHS's new technology needs to be focused on operations and end users to create cheaper technology faster, using multiple ways to work with the private sector.[143]

This following section elaborates on the overall opinion and subthemes with content from the interviews.

Homeland Security technology needs to be focused on operations and end users.

Over half of the stakeholders cited the need for a systems-level view of technology from an operations point of view. Focusing on concepts of operation will be important to describe the risk perspective from a technology and operations point of view.

DHS stakeholders recognized that the ideal technology-development process starts with end-user needs, but the current DHS process does not capture those needs systematically. Overall, DHS needs to do a better job defining the requirements of its end users.

Many stated that DHS user needs are not well defined, and therefore, meeting those needs with new technology is sub-optimal. Others observed that DHS needs to move away from iterative field testing to system-level views of technologies.

There was consensus that R&D is moving faster than the implementation of new homeland security technologies. Therefore, assessing engineering risk for integrating a product into a system is important for DHS.

Technology integration in operational settings is suboptimal for DHS, especially for state and local users. These users often buy equipment with Office of Domestic Preparedness grants and do not know how this equipment will work in joint operations. Interoperability is the number one problem in state and local coordination for communication and operational sharing of equipment.

In general, key features of homeland security technologies for end users are portability (size and weight) and cost.

The USG needs multiple ways to work with the private sector to create new homeland security technologies.

Because of urgency and cost factors, some DHS stakeholders suggested that the USG needs multiple paths to acquire new homeland security technologies. One stakeholder reported that his agency represents the traditional USG mindset,

[143] This opinion is consistent with the findings of DHS's Second Stage Review, which was announced by Secretary Chertoff in July 2005.

which has a policy that staff cannot talk with industry. Also, many USG career officers do not know how industry works. Hence, this stakeholder sees the single acquisition path as a barrier for the entrepreneur to get a new technology to the USG. Multiple paths to work with the USG could overcome this barrier.

DHS stakeholders suggest many different ideas for multiple paths to acquire new homeland security technologies, along with the USG VC concepts. One idea is creating a "public exchange" where technology entrepreneurs could go as a first point-of-contact and get more information on DHS technology needs. This X-Change office must be able to explain to potential technology providers what the DHS technology needs are in industry and market terms.

New homeland security technologies need to be created faster and cheaper.

A little less than half the stakeholders stated that a sense of urgency exists for implementing new homeland security technologies. One stakeholder thought that even less-than-perfect technologies may serve as deterrents to terrorists. Another stakeholder noted that a technology edge against "the bad guys" can erode in as little as 2 years. Thus, constant innovation is necessary to stay ahead of an adversary.

Given the urgency of the situation, many DHS stakeholders stated that the traditional USG acquisition process is too slow and segmented to keep up with the changing terrorist threat and natural disaster needs. Therefore, the DHS acquisition cycle—and the life cycle of homeland security technologies—should be accelerated.

Despite the urgency of the situation, DHS stakeholders also recognized that homeland technology solutions needed to be sensitive to cost. Homeland security technology solutions needed to be affordable to USG end users (e.g. Border Patrol), state and local users (e.g. fire departments) and private sector adopters (e.g. cargo security).

The DHS stakeholders recognized that sometimes choices need to be made between an expensive 100% solution and a lesser-expensive 50% solution. The USG needs to make sure that it will not "price ourselves out of the game" and make good trade-offs between cost and security. One example cited was consideration of the life cycle cost and footprint of technology. In one DHS component, the purchase of equipment is cheaper ($50-60M) than the cost of installation, facilities, and running the equipment ($300M), which can be 4 to 5 times the cost of technology purchase.

DHS is different from CIA in significant ways.

The HSI study team used the In-Q-Tel model for discussion purposes during the interviews. The study team briefly outlined features of the In-Q-Tel model and asked DHS stakeholders to discuss their DHS office in the context of lessons

learned from In-Q-Tel. Therefore, many stakeholder comments revolved around how the CIA compared to DHS, even though many stakeholders had limited knowledge about the CIA or In-Q-Tel. The HSI team has documented the perceptions of the DHS stakeholders as stated, regardless of whether or not the opinions were correct about the CIA or In-Q-Tel. This part of the interview helped stakeholders think about how a USG VC would work in a real-world context. These comparisons are categorized and summarized in Table 3.1.

DHS Stakeholder comments comparing the CIA and DHS fell into 4 categories:

- Type of technology needs
- Communication of research needs
- Breadth of agency mission
- Performance of laboratory research

Table 3.1: Common DHS stakeholder opinions on how the CIA compares to DHS

	CIA	**DHS**
Type of technology needs	CIA uses cutting-edge technology. Observing VC deals helps them keep up with the latest technology.	DHS needs evolutionary vs. revolutionary technology.
Communication of research needs	CIA needs covert research. In-Q-Tel works for the CIA because in this way the CIA can distance itself from what they need. USG intelligence will not talk about what they need overtly. CIA doesn't use traditional contracting mechanisms, like BAA.	When DHS needs an increase in capability, it tells the world. DHS is a public organization with public needs. If it had secret technology needs and a sensitivity about this, then a USG VC might make sense for DHS. DHS is concerned with international travel and trade, which are shared global issues with the private sector.
Breadth of agency mission	CIA has a unified command, and its mission is narrow.	DHS has differing internal views and is a much larger agency. DHS will need to define end users, risk, and priorities.
Performance of laboratory research	CIA does not have government-dedicated labs.	DHS has government-dedicated labs for research.

DHS needs evolutionary technology, while CIA needs revolutionary technology. DHS stakeholders stated that CIA uses more cutting edge technology than DHS, which has more evolutionary versus revolutionary technology needs. They observed that the CIA could use In-Q-Tel to monitor the latest technology, and this cutting-edge technology is what made In-Q-Tel successful.

DHS research needs are public, while the CIA's are covert. DHS stakeholders stated that CIA needs covert research because of the nature of their mission. USG intelligence will not talk about what they need overtly. Therefore, the CIA can distance itself from what it needs through In-Q-Tel. Also, CIA doesn't use traditional contracting mechanisms, like Broad Area Announcements (BAA).

In contrast to the CIA, all DHS research needs are overt, because it is a public organization with public needs. Also, these needs such as secure international travel and trade are shared globally with the private sector. Therefore, some stakeholders concluded that only if DHS had secret technology needs (such as for the US Secret Service) would an "In-Q-Tel like" model work.

DHS is a larger agency with a broader mission, while the CIA is a smaller agency with a narrow mission. Therefore, DHS stakeholders noted that CIA has a unified command, and its mission is narrower than DHS. In contrast, DHS has differing internal agency views and is a much larger agency. Stakeholders commented that DHS must define end users, risks, and priorities for a USG VC; this will be harder for DHS than for the CIA.

DHS has dedicated labs to perform research, while the CIA does not DHS statekolders observed that the CIA does not have dedicated labs, while DHS has national government and DHS labs to perform research. DHS laboratory capability gives DHS access to public technology that the CIA does not have. Because of dedicated labs for DHS, it may not need a USG VC.

Opinions Differed on Applying the USG VC Model for DHS

DHS stakeholders held conflicting opinions about a general USG Venture Capital concept, as applied to DHS. They felt strongly and divergently about whether a USG VC concept would help or hinder development of homeland security technologies. The arguments heard in the interviews are categorized and summarized in Table 3.2

Table 3.2: Divergent Stakeholder Arguments For and Against a USG Venture Capital Concept for DHS

	For USG VC Concept	Against USG VC Concept
How DHS Works as an Agency		
Definition of Success for USG VC: Will the USG VC goal support the DHS mission or create viable companies?	USG VC must focus on the DHS agency mission.	The purpose of VC is to create viable companies, which leads to economic success, not necessarily agency mission success.
DHS Culture Change to Use USG VC: Can DHS become responsive enough to take advantage of an entrepreneurial program?	An entrepreneurship culture exists at In-Q-Tel as compared to the USG intelligence community.	DHS culture would have to change radically to play in a venture capital world, where 2 months is a long time.
How DHS Develops Technology Internally		
Key Barrier to Implementing New Homeland Security Technology: Is it lack of proprietary information or lack of standards?	USG VC can help DHS get proprietary info. USG VC can be used as a technology scout.	USG VC may be able to help businesses meet particular standards for products, but not speed the standards process.
Scarce DHS R&D Funding: Will a USG VC drain funds from important traditional R&D functions?	A DHS VC allows free-thinking for outside solutions, using public/private partnerships.	A USG VC is defined as a non-competitive, sole-source choice, instead of a competitive university/industry/ federal government research system. Investing in a DHS VC takes funds from important current projects.
End-User Implementation: Does a USG VC help or hinder end-user implementation of new technologies?	Success for In-Q-Tel is defined as delivering solutions to the CIA end user, which is similar to DHS success criteria.	A problem for VC investment for DHS is that operational implementation and sustainability are not a VC's concern.
How DHS Partners with Private Sector to Develop Technologies		
Politics of Access to USG Funding: Is a USG VC partnering with industry or "picking winners"?	A USG VC investment proves the viability of technology because of private sector co- investment.	To pick economic winners and losers, from a fairness point-of-view, is politically difficult for USG.
Current DHS Market Attraction to the Private Sector: Is it sufficient to meet DHS needs or not?	USG's ability to target technology development for government missions in the private sector is missing. USG VC can help attract private companies to adapt their product for noncommercial purposes.	DHS already has a variety of ways of interacting with the private sector and does not need a USG Venture Capital model. Products for solely USG use are a poor investment for VC, which needs to also be commercially viable.
Current DHS interaction with Private Sector Technology Providers: Is it sufficient to meet DHS needs now and in the future or not?	Current USG acquisition processes are not finding the private sector technology solutions for the agency's homeland security mission needs.	How is a USG VC concept different from sending USG program managers to conferences?
How DHS Technology Development Funding Could Change with a USG VC		
Tolerance for Risk in Investing USG funds: Is DHS willing to leverage funds for lower cost technology while taking on more risk for loss of that investment?	USG VC can be used to leverage investment between USG agencies and the private sector to save money for the USG.	Most VC deals lose money.
Cost Sharing with the Private Sector in USG VC: Can the USG make big enough investments to make a difference in creating homeland security technologies?	USG VC can provide cost sharing with the private sector for new technology.	USG VC cannot make deals big enough ($10-100M) to play in regular VC world.

The divergent DHS stakeholder opinions can be sorted into the effects that a USG VC program would have on 4 aspects of DHS:

- How DHS works as an agency
- How DHS develops technology internally
- How DHS partners with the private sector to develop homeland security technologies
- How DHS technology development funding could change with a USG VC

How DHS Works as an Agency

Opinions diverged on whether VCs would support DHS mission needs. DHS Stakeholders felt strongly that investments in technology needed to be focused on DHS mission needs. The stakeholders were split on whether a USG VC could truly focus on the DHS mission, because the nature of VC is to create viable companies.

Opinions diverged on whether DHS could become responsive enough to take advantage of an entrepreneurial program. In the interview discussions, the culture of entrepreneurship at In-Q-Tel was compared to the USG intelligence community, which is more conservative. Stakeholders wondered if the DHS culture could change enough to be entrepreneurial, in order to take advantage of a USG VC. One interviewee noted that the time horizons are different in the USG and in the venture capital world, where 2 months is a long period of time.

How DHS Develops Technology Internally

Opinions diverged on whether the key barrier for DHS new technologies is lack of proprietary information or lack of standards.[144] DHS stakeholders were divided over what was the key barrier to developing and implementing new homeland security technology. Some thought the barrier was lack of information of what the private sector was developing. For these stakeholders, a USG VC might help overcome this barrier.

DHS stakeholders representing state and local users, or private industry technology providers and users, cited lack of standards and evaluation by the USG as barriers for implementing new homeland security technologies. These stakeholders pointed out that often these "outside-of-DHS" end users, such as state and local users for mass-transit security, rather than the USG, would purchase homeland security technologies. Some interoperability problems at the state and local level can be blamed on lack of operational standards. Also, it was cited that standards would help the private sector create or adopt technologies that meet USG homeland security goals. Standards can also help harmonize

[144] This opinion is consistent with the findings of DHS' Second Stage Review, which was announced by Secretary Chertoff in July 2005. This sentiment was also echoed at the recent DHS S&T Private Sector Conference held in Atlanta. Georgia, August 2005. For more information on this Conference, see www.dhstech.org/presentations.htm.

USG policies and investment decisions, especially those that have impacts across the economy, such as cargo security. For these stakeholders, a USG VC tool may not help.

Opinions diverged on whether a USG VC will drain funds from important traditional R&D functions. One stakeholder described a USG VC concept as a noncompetitive, sole-source choice for technology investment. This stakeholder preferred investment in the current competitive university/industry/federal government research system. Other stakeholders worried that investment into a DHS VC would take funds away from important current projects.

Other stakeholders were excited about the possibility of a DHS VC concept. They saw it as allowing free-thinking for outside solutions, which would encourage public/private partnerships.

Opinion diverged on whether a USG VC would help or hinder DHS end user implementation of new technologies. Some stakeholders were encouraged by the success that In-Q-Tel has had in delivering solutions to the CIA end user and could see a similar USG VC usefulness for DHS.

Other stakeholders worried about whether a USG VC would deliver a technology solution and possibly not consider how that VC solution would fit into current operational implementation and sustainability plans. Solutions must be affordable and fit into real-world operations, or they are not useful.

How DHS Partners with Private Sector to Develop Homeland Security Technologies

Opinions diverged on whether a USG VC would be perceived as truly partnering with industry, rather than "picking winners." For USG to pick economic winners and losers is politically difficult. Stakeholders mentioned that sometimes DARPA programs and the Advanced Technology Program in the National Institute of Standards and Technology get into trouble with the U.S. Congress for "skewing the market" by using government money for technology investment. However, other stakeholders said that private sector co-investment with a USG VC indicates commercial viability of the technology.

Opinions diverged on whether there was enough market attraction to the private sector for DHS needs. Stakeholders mentioned that it would be useful if the USG had the ability to target technology development for government missions in the private sector. Others were looking for opportunities to attract private companies to adapt their product for noncommercial purposes. They thought a USG VC concept might help with these problems.

Another group of stakeholders believed that DHS already has a variety of ways of interacting with the private sector and does not need a USG VC model. Also, stakeholders recognized that products solely for USG use are a poor investment choice for VC, which needs to also be commercially viable.

Opinions diverged on whether there was enough interaction with private sector technology providers for DHS needs. Some stakeholders found that current USG acquisition processes were not finding the private sector technology solutions needed for DHS homeland security mission needs, so that a USG VC concept might help uncover some solutions. Others were not convinced that a USG VC would have any greater insights to the private sector technology than the traditional method of sending USG program managers to conferences.

How DHS Technology Development Funding Could Change with a USG VC

Opinions diverged on whether DHS was willing to take on more risky investments in the USG VC model. Many stakeholders were excited by the possibility that a USG VC could be used to leverage investment between USG agencies and the private sector to save money for the USG. Others were more cautious about the benefit to the USG and mentioned that most VC deals lose money.

Opinions diverged on whether a USG VC could make big enough investments to truly affect technology development for DHS. Some stakeholders liked the idea that a USG VC concept could provide cost sharing with private sector for new technology. However, other stakeholders believed that a USG VC program could not make deals big enough ($10-100M range) to play in the regular VC world.

Opinions diverged on how current DHS offices, authorities, and programs could substitute for a USG VC model.

DHS stakeholders talked about a USG VC model in the context of current DHS offices, authorities, and programs. Some stakeholders believed that current DHS functions like Homeland Security Advanced Research Projects Agency (HSARPA), OTA,[145] SBIR program, Rapid Technology Application Program (RTAP), and traditional announcements with BAA and Request for Proposals (RFP) could substitute for a USG VC model. Others disagreed that current DHS programs could play a USG VC-like role. The arguments heard in the interviews are categorized and summarized in Table 3.3.

[145] See http://www.hsarpabaa.com/Solicitations/legal.pdf for more information about how OT Authority is currently used in DHS.

Table 3.3: Divergent DHS stakeholder opinion on what current DHS offices, authorities, and programs could substitute for a USG VC model

	Current Role	YES, Can Substitute for USG VC	No, Cannot Substitute for USG VC
HSARPA	HSARPA interacts with the private sector in competitive programs. The spectrum of DHS requirement related to the private sector resides in HSARPA.	HSARPA works as In-Q-Tel for current DHS needs. If VC fund's purpose for DHS is to spur development, then that is HSARPA's role.	
OTA	OTA contracts are like commercial contracts. They avoid government accounting and acquisition rules. OTA is a boon to rapid prototyping, contractors new to the government, and other cost sharing agreements.	A R&D OTA contract can be used for a venture capital result.	OTA contracts have not helped to build businesses, as a USG VC would. OTA is a problem when you use nontraditional contractors for hardware solutions. Small companies cannot produce enough for the USG. OTA did not work well for a program—for 1 contract it added 5 mo. to process the contract.
SBIR		The SBIR program can be used as a VC fund, if it is used strategically, and can be a win-win for the small business and the USG. The hit-rate between USG VC and SBIR is about the same, 10%.	SBIR program for mission critical technology has limits, since the small business owns the IPR. Sometimes, the small business cannot make the product at the scale needed.
RTAP	RTAP's purpose is to turn operational needs around in 16-18 mos. The DHS requirement generation committee funded 28 projects. End users commit to buy the product 9 months from now.	DHS components like the RTAP meet near-term needs.	Some DHS components worry about the integrating and sustaining RTAP products into their operations.
Traditional USG announcements for new technology		DHS S&T has access to small business through BAAs and RFPs.	Traditional announcements have not found the technology needed for DHS's mission needs.

HSARPA is generally seen as substituting for a USG VC function. According to many DHS stakeholders, the spectrum of the DHS requirement related to the private sector resides in HSARPA. HSARPA interacts with the private sector in competitive programs. A USG VC would compete with HSARPA's role to spur development in getting products from the market. One stakeholder stated that HSARPA has worked "like an In-Q-Tel for my current DHS needs."

Opinions are split about whether OTA can substitute for a USG VC function. Many stakeholders cited DHS's OTA, as a substitute for a USG VC.

OTA contracts are like commercial contracts. These contracts avoid government accounting and acquisition rules. As described by DHS stakeholders who have used these authorities, OTA is a boon to rapid prototyping, contractors new to the government,t and other cost sharing agreements. A few DHS stakeholders stated that a R&D OTA contract could be used for a venture capital result.

Other stakeholders stated that OTA contracts have not been used to help build a business as USG VC could. Also, DHS stakeholders cited problems with OTA contracts. One problem occurs when nontraditional contractors are used for hardware solutions. Sometimes these small companies cannot produce at the level needed for the USG. Also, another stakeholder reported that OTA has not worked well for a program, since for one contract, it added 5 months to process the contract.

Opinions are split on whether DHS's SBIR program can substitute for a USG VC function. Many DHS S&T stakeholders were enthusiastic about using the DHS SBIR program as a USG VC. They saw the SBIR program as a win-win for the small business and the USG, if used strategically. Also, the success rate of VC and SBIR is about the same, at 10%.

Other DHS stakeholders reported the limits of using the SBIR program for mission critical technology, since the small business owns the intellectual property rights (IPR). Sometimes, the small business cannot make the product at the scale needed.

DHS stakeholders like RTAP for near-term needs. The RTAP in HSARPA turns around a DHS component operational need in 16–18 months. It was funded at $30 million in FY05, which was the first year of the program. The model is based on an Army program. In its first year, the DHS components' requirements generation committee chose to fund 28 projects. To fund projects, the end users need to commit to buying the product soon after the completion of the program. Some DHS component stakeholders are enthusiastic about the RTAP process for meeting near-term needs. One DHS component worried about the integration and sustainability of RTAP products into their operations, because of the quick turn-around time. This program could compete with a USG VC because of its focus on quick turn-around needs.

Opinions are mixed on whether traditional USG announcements, like BAA and RFP can work for DHS new technology needs. Many DHS stakeholders said they had plenty of access to small business through BAA and RFP processes. However, one stakeholder reported that the traditional announcements have "not found the technology needed for our component's mission."

Summary of DHS Stakeholder Opinions

DHS stakeholders agree that the creation of technology using multiple ways to work with the private sector quickly is important for DHS end users and operations.

In contrast, DHS stakeholders have diverse opinions on whether a USG VC can help DHS bring new technology to end users faster. Some believe that the differences between the CIA and DHS show that an In-Q-Tel-like model would not work for DHS because of differing requirements for technology, communication of research needs, breadth of agency mission, and ability to perform laboratory research.

DHS stakeholders held opposing opinions on whether a general USG VC model would work for DHS. These opinions depended on 4 effects that stakeholders thought a USG model would have on:

1. How DHS works as an agency
2. How DHS develops technology internally
3. How DHS partners with private sector to develop homeland security technologies
4. How DHS technology development funding could change with a USG VC

Many DHS stakeholders thought of current DHS offices, authorities, and programs such as HSARPA, OTA, the SBIR program, the RTAP initiative, and traditional announcements using BAA and RFP as substitutes for a USG VC model.

This review of DHS stakeholder opinions shows that serious debate within DHS exists about how DHS delivers new technology to end users and whether a USG VC model can help.

Given the widely varying views of the DHS stakeholders, to arrive at a consensus on the best course of action for DHS is difficult. What does emerge, and is shared with those agencies that have started venture capital programs, is recognition that the private sector has much more to offer than is being effectively accessed by DHS and the federal government. This particularly applies to small, emerging companies that do not have the experience, resources, or interest in working with the government. To find ways to use them as resources is an enduring challenge; no single program or approach can serve as a panacea.

CHAPTER 4: FINDINGS AND RECOMMENDATIONS

Science and technology provide the foundation that enables the significant advances we have achieved [in enhancing our country's homeland security effort]." [146]
— John H. Marburger, III

Our study demonstrates that DHS is still an evolving agency. Many missions and cultures are still being integrated. Our interviews found differing views on the goals, process, and priorities among DHS officials. Correspondingly, we found many differing views on the potential value of a DHS venture capital effort. However, the study did glean common themes that are the basis for our conclusions and recommendations.

All stakeholders, regardless of department or pre-DHS agency, felt strongly that DHS culture needed to change to be able to respond to technological innovation. Almost all described the DHS acquisition process as dysfunctional; they stressed that major changes were needed regardless of new policies like a USG VC.

Findings Related to DHS Stakeholder Views

DHS is focused on finding, fostering, and using commercial technologies. As articulated by the stakeholders, the DHS goal is to find and foster new technologies, but the primary end users will be outside DHS in the broader homeland security community. These include state, local, and tribal officials, and also the private sector stewards of critical infrastructure, transportation, and health care. The key question for a DHS VC is: Can a DHS VC effort effectively find and foster new technologies that may be purchased by non-DHS end users?

Regarding the value of a DHS VC effort, similar to other USG VC programs, we found the following views in DHS:

Culture Change: A VC effort might assist in bringing an entrepreneurial culture to DHS and accelerating the acquisition and life cycle of homeland security technologies.

Multiple Paths: DHS needs to develop multiple paths to private sector technologies and innovation; a VC effort could be one (but not the only) path.

Proprietary Information: DHS needs a technology scout and an open venue where new vendors and innovators can present ideas and get immediate feedback

[146] Marburger, John H., III, Director, Executive Office of the President, Office of Science and Technology Policy. August 18, 2005. "Science and Technology: A Foundation for Homeland Security." Office of Science and Technology Policy. http://www.ostp.gov/html/OSTPHomeland.pdf. Even a casual perusal of this document will powerfully convey the many technology-related activities underway that, in one way or another, can benefit from a productive collaboration with the venture capital community.

on their technologies; the competitive procurement and award process is not adequate to spur more focused and refined developments.

Partnership: DHS will not be the ultimate or the only mass consumer of the technologies it fosters. Therefore, linkages must be developed if DHS-sponsored venture investments are to result in wide acceptance of the technologies.

Strength and Weaknesses of USG VC Models for DHS

The strengths and weaknesses of these models for DHS are listed in Table 4.1.

Table 4.1: Strengths and Weaknesses of USG VC Types for DHS

USG VC Program Type	Strengths	Weaknesses	DHS Value	HSI Comment
Direct Investment	Attracts proposals, leverages private sector investment, provides influence over strategic direction, has early access to proprietary info, and allows early adoption of new tech	High startup costs, public funds at risk, possible allegations of favoritism, and successes could be windfalls to co-investors are all issues.	Tech scout, direct tech development to Homeland Security functions, and commercialization assures availability, cost reduction for end users	Requires strong internal team to refine DHS problem set, receive flow of potential technologies, and manage rapid feedback loop to inform the VC about technical merit and feasibility.
Information and Collaboration	Low startup cost, no infrastructure required, low overhead, no financial risk, aligns with existing outreach goals, and transmits sponsor's tech goals to industry leaders.	Spectator seat, not a player, dependent on good will, filters applied by participating VCs. Little influence over companies, limited access to proprietary info, and early adoption.	Easy start, new path to private sector, transmits DHS tech needs. Dialogue can influence investment decisions by VC. Some vision into emerging tech.	Success depends on perceived value to VCs since they control information; there must be a link to increased business opportunity.
Tech Transfer	Same as Direct Investment; also may reduce cost, increase public benefit.	A focus on an existing tech portfolio, urge to "force fit" a commercial use, and desire to keep funding "life support."	Might spur mass production, and lower cost for DHS-funded tech research.	Not DHS core need; more focused on finding and using new tech than commercializing existing creations.
Financial Risk Underwriting	Lower overhead, due diligence by private investors, and lower financial risk only covers part of loss, track record.	Limited influence over companies, cannot initiate investments, and only commercially viable ideas are surfaced.	Might be of value in working with VCs that have homeland security focus.	Might enable a few deals that are on the financial fence; will not likely spur new technology needs identified by DHS.

This analysis and the views expressed by DHS stakeholders during interviews suggest that some adaptation of the information and collaboration and direct investment models could serve DHS needs. The technology transfer model is less useful for DHS, since it is focused on commercializing existing USG research, which is not a core need of DHS. The financial risk underwriting is the least useful option. Though it might enable a few deals that are on the financial fence, the financial risk underwriting model will not likely spur new technology needs identified by DHS.

DHS primarily drives technology development by collecting mission needs from operators, presenting technical challenges to the private sector, and funding the best proposals through a competitive selection process. Both the direct investment and the information and collaboration models can reach that element of the private sector—an element that is actively monitored by and actively markets to the venture capital community.

Policy Options for DHS

HSI identified 5 options for DHS. The first 4 options are based on current USG VC models. The last option distills a key feature of successful USG VC models into an incremental VC model, which can serve as a new developmental path to future innovative interaction with the entrepreneurial private sector.

The policy options for DHS in implementing a USG VC model can be arrayed based on DHS funding and DHS institutional commitment. Institutional commitment derives from lessons learned from successful USG VCs, such as top leadership support, high visibility within and outside the sponsoring agency and internal agency staff, who have change agent qualities. (See Figure 9.)

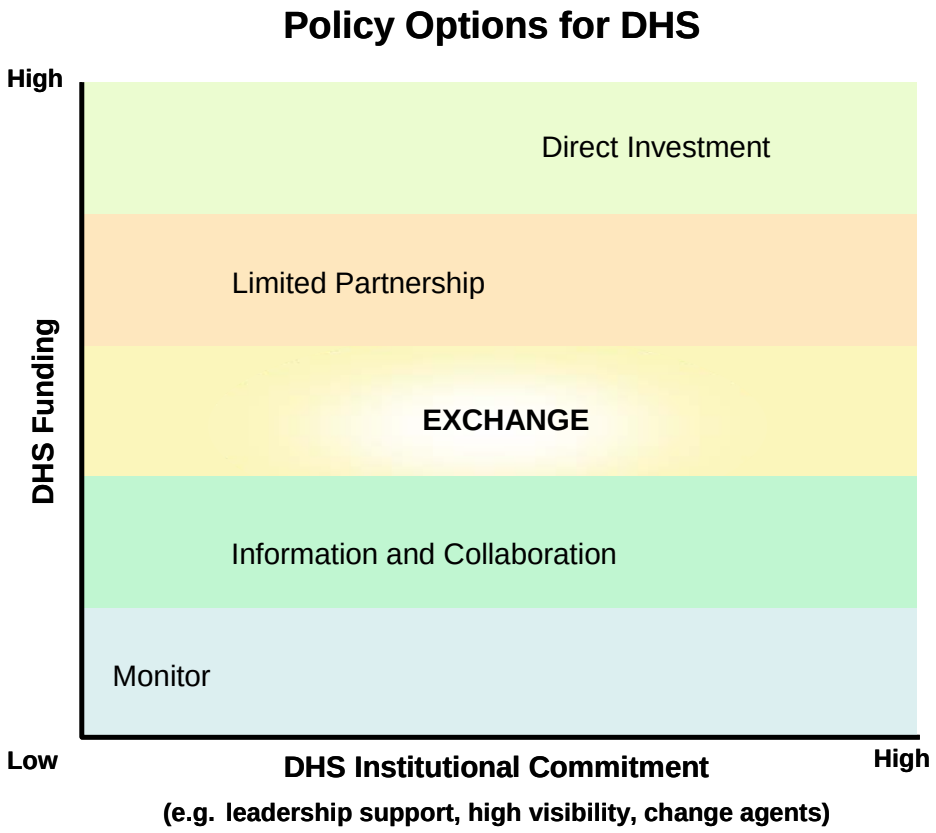

Figure 9: Policy Options for DHS

DHS institutional commitment is the X-axis, with increasing DHS funding up the Y-axis. Budget and personnel needs are rough estimates based on experiences of other USG VCs.

1. **Monitor Existing Models.** This option is the first and lowest cost. It requires some oversight and a limited budget (approximately 1 full-time employee (FTE). The existing USG VC programs are at various stages of maturity but are giving visibility to new technologies and best practices. All of the existing programs are fairly open to collaboration with other agencies, although their technology focus may not completely align with DHS needs. DHS could monitor those programs while continuing to consider its own USG VC. More specifically, DHS could wait until:

    - A more precise DHS problem set exists that is understood and accessible.
    - End users are more engaged in the technological process.
    - Standards for new technology are more definitive.

    DHS may not have made optimal use of existing authorities and programs (such as OTA and SBIR); therefore, the investment of time and money needed for a venture capital effort may not be warranted at this time. Also,

in this monitoring phase, more information will continue to come in about other USG VCs. The Army fund will complete a review soon, and the NASA program is currently being established. This option requires a continuous eye on other government VC programs.

Resources Required:[147] 1 FTE; $300K overall

Legal Authority. No additional statutory or other authority is required for Option 1.

Section 302 of the Homeland Security Act of 2002 states: "The Secretary, acting through the Under Secretary for Science and Technology, shall have the responsibility for … (2) developing …and coordinating the Federal Government's civilian efforts to identify and develop countermeasures to chemical, biological, radiological, nuclear, and other emerging terrorist threats … [and] (6) establishing a system for transferring homeland security developments or technologies to Federal, State, local government, and private sector entities …." Therefore, outreach to other USG VCs and the venture capital community assists in identifying and developing such countermeasures.

2. **Establish Information and Collaboration Model USG VC.** This option requires a little more funding and institutional commitment from DHS (approximately 3 FTE). The option is similar to the programs in DoD and the Navy. DHS could designate an office to make regular and continuing contact with the other USG VCs and private sector VC community. The office could also monitor publicly-announced transactions, develop a more detailed statement of the homeland security technology areas that are of interest, and build a network with the VC funds that are actively pursuing similar areas. Additional personnel and resources are required for travel, conferences, and administration.

   Resources Required:[148] 3 FTE; approximately $750K overall

   Legal Authority: No additional authority is required; it is within existing roles and mission for the Private Sector Office and the S&T Directorate.

3. **Establish Limited Partnership Model with One or More USG VC Funds.** This third option is equal to the institutional commitment with the Information and Collaboration USG VC model. However, DHS funding is slightly more ($5–10M/year minimum, based on other government programs). Like traditional VC funds, a USG VC program can extend its reach if its fund size, and consequently its deal capacity, expands. In-Q-Tel, for instance, has expanded from its original sponsor (CIA) to support 4 other agencies (NGA, NSA, FBI, DIA). DHS could seek a position as a limited partner in one or more of the existing funds, rather than creating its own, potentially competitive, program. The benefits of this option include sharing

[147] Budget and personnel needs are rough estimates based on experiences of other USG VCs.

[148] Budget and personnel needs are rough estimates based on experiences of other USG VCs.

the overhead burden with other agencies, relying on an established, authorized infrastructure, and sharing the expertise the sponsor agencies have gained. Downsides include DHS not being able to drive the focus of the fund, having to look for synergy with prime sponsor needs, being dependent on funding and continuation decisions from the prime sponsor, and needing statutory and other agency approval to transfer funds to this program.

Resources Required:[149] 5 FTE; $5–10M overall (based on existing average investments per company of $1–2M)

Legal Authority: Other agencies have become limited partners with existing USG VC by either transferring funds under intergovernmental transfers or following congressional funding direction. Some agencies have interpreted the limitations of Economy Act transfers to prohibit an equity investment in a private company when the transferring agency does not have independent authority for such investments, under the principle that the transfer cannot be used for a purpose that was prohibited for the transferring agency. A more detailed examination of DHS authorities and limitations with intergovernmental transactions should be conducted if the limited partnership option is pursued.

4. **Establish Direct Equity Investment Model.** This option requires the most funding and institutional commitment of all the options. It is based on the CIA's In-Q-Tel and the Army's OnPoint program and would cost at minimum $25 million year to do 8–10 deals. The benefits of this option are DHS control, visibility, and a clear place for innovators to approach DHS with ideas and funding needs. It would require that the investing office be closely aligned with the technology needs of end users. DHS can emulate best practices as the new NASA fund plans to do. However, NASA has garnered support for its efforts from a Presidential Commission and other reviews, and has some financial support from Congress. The downsides of this option are high startup costs, probably 2–3 years before notable results, and the possibility that the VC market may be saturated with USG VC shops. DHS may have difficulty (at this stage in its existence) adopting the high-risk tolerance that a venture capital program requires. The USG VC and its overseers must be prepared for scrutiny of any significant losses, as well as the occasional significant windfall. Also, the USG budget has many demands on it at the moment: the war in Iraq, the Global War on Terrorism, and the response to Hurricanes Katrina and Rita. It may be difficult to find new federal money for the Direct Equity Investment Model option.

   Resources Required:[150] 10 FTE; $25M overall budget (annual)

   Legal Authority: The CIA/In-Q-Tel program was established under existing CIA contract authority, but had congressional endorsement in reports accompanying the Intelligence Authorization Act. The Army/OnPoint program was established under a direction contained in the conference report

[149] Budget and personnel needs are rough estimates based on experiences of other USG VCs.

[150] Budget and personnel needs are rough estimates based on experiences of other USG VCs.

for the FY 2002 Defense Appropriations Act. See Ch. 2, n 66 supra. Neither program had express, statutory authorization for direct equity investments in private companies, but in both instances the contractor, not the government, makes an investment. The contractors are accountable to the government under the terms of their contract. The Army program was started with an OTA according to 10 USC §2371.[151] CIA used a modified "FAR-like" contract; it does not have other transaction authority.[152] DHS may be able to use its other transaction authority (6 USC §391) in a manner similar to the Army. The study team has been told that NASA also believes that their OTA authority (42 USC §2451) can be used to establish a direct investment program.

5. **Create an Internal DHS Venture Capital X-Change Office Model**. This final option proposes a new path to a DHS VC program. This model would start in a dedicated DHS office and would encompass the Information and Collaboration model. When this X-Change office has been functioning for a few years, DHS would be well-placed to make decisions on entering limited partnership agreements or creating a nonprofit direct equity investment model. The minimum amount of DHS funding and institutional commitment is estimated at 15 FTE, and $5 million overall, not including space, travel, and conferences. This option was distilled from a key characteristic of successful USG VC models: the effectiveness of the interface with the sponsoring agency(ies). This option would establish this DHS interface, which we liken to an exchange. The name "X-Change" emphasizes that this exchange creates value for DHS and the commercial sector; it is not just a pass-through function.

   Resources Required:[153] 15 FTE, $5M overall

   Legal Authority: No additional legal authority is required for the creation of the X-Change; the scope of activity appears to be within the existing charters for the Private Sector Office and the S&T Directorate. Additional legal authority or approvals may be needed to allow for detailing private sector personnel to the X-Change.

[151] Briefing to Federal Laboratories Consortium SBIR/STTR Workshop, August 2004, by Nancy Norton, Contract Specialist, US Army CECOM; http://www.federallabs.org/northeast/ContentObjects/Proceedings/August2004_FLC-CTC_Meeting/Thursday/August2004_FLC-CTC_Regional_Meeting_Norton.pdf

[152] Business Executives for National Security Report on In-Q-Tel, July 2001, p. 31.

[153] Budget and personnel needs are rough estimates based on experiences of other USG VCs.

Recommendation to DHS: Create an Internal DHS Venture Capital X-Change Office

The HSI study team recommends, based on our study, that DHS establish a DHS VC X-Change Office as the preferred option.

- The DHS VC X-Change Office would be a foundation for DHS to have the flexibility to move down a variety of paths within the private sector in the near future.
- DHS faces a collaborative and communication problem. The X-Change offers the ability to connect with companies engaging in cutting-edge research and to partner with them in early technology development.
- Costs would also be kept to a minimum by partnering in the development of technology.

This approach would help solve these problems and incorporate the Information and Collaboration model. Setting up the DHS VC X-Change would allow DHS the time to assess its own needs and the role VC could play. It could facilitate a change in DHS culture to align more closely with the attitudes of VC that would lead to a better working relationship. DHS would then be in a better position to set up either a Limited Partnership model or evolve into a Direct Equity Investment model, (and a separate entity like In-Q-Tel) in the future.

In reviews of existing VC programs, the interface with the sponsoring agency is often cited as a key element of success. Without a strong interaction between the outside corporation (or the VC community generally) and the mission-focused users and experts inside the sponsoring agency, Information and Collaboration or Direct Equity Investment models are dependent on the spare time and occasional focus of already overtaxed personnel. In its congressionally-directed study of In-Q-Tel, the Business Executives for National Security (BENS) Panel emphasized the importance of the CIA's interface center to the identification of appropriate technologies and the transfer of funded solutions to end users.[154] This has been repeatedly endorsed by government executives with oversight responsibility for the programs, and is being followed by other agencies engaging with In-Q-Tel as limited partners.[155]

[154] Ibid, pp. 22-24.

[155] See Investing in Intelligence, Spy Agencies Seek Innovation Through Venture-Capital Firm Jay Solomon, Wall Street Journal, 12 September 2005, Page A4; and In-Q-Tel, CIA's Venture Arm, Invests in Secrets, By Terence O'Hara, Washington Post, Monday, August 15, 2005; D01

The DHS VC X-Change would create a foundational relationship between DHS and the private venture capital sector. (See Figure 10, Model of Internal DHS X-Change Office.) This office would exchange and extract information for DHS from entrepreneurs and private venture capital firms. The information gathered in the VC X-Change would immediately help DHS be more responsive and flexible with the commercial sector in supplying solutions and results to end users.

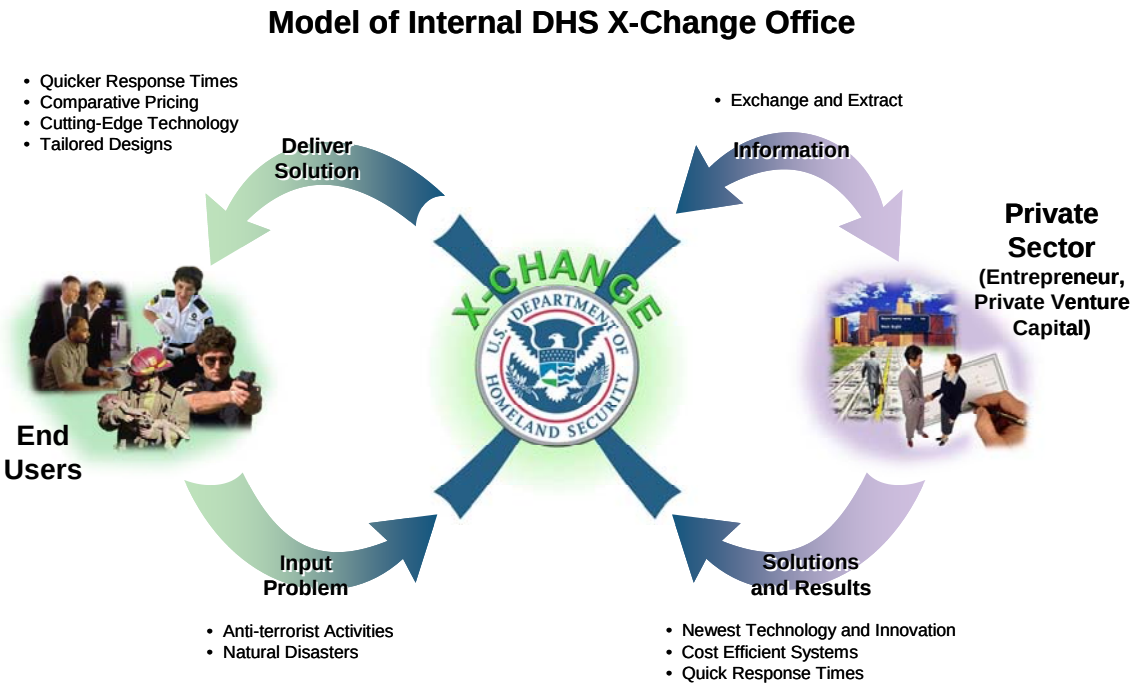

Figure 10: Model of Internal DHS X-Change Office

End-user needs are important components to the DHS VC X-Change, as shown in the Model. X-Change staff would gather homeland security problems from an end-user perspective and exchange that information with the private sector in a venture capital perspective. Collaborating with the private sector, the DHS VC X-Change Office would be able to deliver effective, faster, and less expensive solutions to homeland security problems.

This option is the best for now, because it sets up a versatile mechanism that is necessary for information and collaboration with VCs and useful in the future for Limited Partnership or Direct Equity Investment options. This X-Change Office option will enable a more detailed analysis of multiple ways of collaborating with the commercial sector over a longer period of time than was possible in this study. Also, if a compelling deal emerges, a DHS VC X-Change mechanism could accelerate a transition to a Direct Equity Investment model.

Regardless of future decisions regarding VC activities by DHS, the X-Change could serve important functions as DHS seeks to expand and improve its relationships with the private sector, especially small and emerging companies. The X-Change can identify and move forward, compelling new technologies to DHS components that may be interested. The X-Change can serve as a new outlet for information and assistance in engaging with existing DHS technology programs, such as SBIR, RTAP, and small business set-asides. The X-Change can serve as a technology scout for all DHS components, tracking industry news and publications, monitoring investment and acquisition transactions, and feeding information to appropriate DHS components, which because of mission imperatives cannot stay abreast of the fast pace of innovation.

The information gathered in the DHS VC X-Change would immediately help DHS to be more responsive and flexible to the commercial sector. The DHS VC X-Change should be populated with both experienced DHS staff who know the Department's mission and technology needs, and people with deep, current, commercial experience who serve for no more than 2 years with the DHS X-Change. This coupling of inside and outside expertise has been a hallmark of successful USG VC programs, and can be emulated without creating a free-standing corporation on the outside. Indeed, some corporations (i.e. information technology, cybersecurity, pharmaceutical companies) may be willing to detail key people on a nonreimbursable basis. The maximum tenure is important because essential knowledge and networks fade quickly and these members must have current knowledge and networks in the private sector to open the lens of DHS to new opportunities.

The benefits of the X-Change office option include (1) the DHS VC X-Change can be implemented quicky under existing authority. (One exception: the use of commercial detailees may require legislation.); (2) the DHS VC X-Change can get DHS ready for either evaluating limited partnerships with an existing fund, or for establishing a nonprofit corporation for direct investment; (3) the DHS VC X-Change can begin the Navy-like Information and Collaboration model dialogue right away.

The X-Change office can start by helping DHS clarify its vision for its technology investments, through gathering information from end users and technology providers. The Department will need input from all its end users: DHS components, state and local governments and private sector users, especially in critical infrastructure, since these groups will bear the burden of using, purchasing, and maintaining new technologies. Through the interaction of the X-Change Office with end users and providers, the Office can create a strong problem set. Later, the X-Change Office can help scope the evaluation of a Limited Partnership model with an existing fund or establishment of a non-profit corporation for the Direct Equity Investment model using the DHS problem set it created.

The disadvantages of this option are that it is a half step and may not open all the doors that DHS needs to the commercial sector. Without direct investment,

private VCs may shade their recommendations to companies that are already in search of markets for existing products, as opposed to developmental stage companies whose products may not emerge without DHS help. Similarly, if the DHS requirements-generating mechanisms are immature, nonexistent, or dysfunctional, additional investment will be needed to communicate realistic DHS market opportunities to the VC community.

There are some caveats to consider about the X-Change Office proposal. Because the X-Change Office will be focused on building new capabilities like In-Q-Tel,[156] cost-benefit analysis will not be the best measure of its effectiveness. To track how the X-Change Office creates mission success by enabling high-impact technologies and building new companies to support DHS' evolving mission needs will be important.

The roles between HSARPA and an X-Change Office will have to be clarified. Currently, the HSARPA mission is described as engaging the private sector in R&D to: (1) satisfy DHS needs in operational requirements, (2) conduct rapid prototyping and commercial adaptation, and (3) R&D of revolutionary options.[157] HSARPA has only 15 program managers or office directors out of a total of 85 personnel (including civil servants, Interagency Personal Agreement (IPA) staff, detailees from other agencies, and contractors).[158] HSARPA Program Managers own their program and provide technical leadership. HSARPA also manages the SBIR and unsolicited proposal programs for DHS. HSARPA broadcasts competitive public solicitations to a broad array of private sector sources, including small and large business, universities, independent labs and teams of all compositions. HSARPA has managed 15 public solicitations, leading to 40 multi-project research programs. Barriers to HSARPA's solicitation process are lowered by use of white papers and a teaming website. Also, HSARPA has a variety of contracting vehicles (including Other Transaction Authority).

In contrast, an X-Change Office could focus on a technology scout role. Instead of concentrating on competitive public solicitations, the X-Change could engage directly with non-traditional, entrepreneurial technology providers. While HSARPA Program Managers could direct their attention on their program execution, X-Change staff would focus on interacting with new technology providers and defining DHS problem sets in VC vocabularies. The X-Change Office would be the "front door" for entrepreneurs to get feedback on their technology ideas. Some X-Change staff could include representatives from the private sector who are detailed on career-development sabbaticals for 2 years. This would insure that the X-Change Office gets access to relevant and accurate

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[156] See In-Q-Tel's website for more information on its measures of success. http://www.In-Q-Tel.com/about/model.html.

[157] See http://www.dhstech.org/PDF/August_23_2005/Tue_0800-1000/03_HSARPA-Overview_Kubricky_FINAL_82205.pdf for an overview of HSARPA mission, vision and functions.

[158] HSARPA staff and budget information came from an e-mail communication to HSI from the HSARPA Office on November 10, 2005.

information about industry innovation and investment trends, and that DHS benefits from an outside, commercially focused perspective.

The X-Change Office could also be tasked with further detailed study of the Limited Partnership and Direct Investment model options detailed above. As it builds networks within DHS and externally, the X-Change Office would be in an ideal position to evaluate DHS readiness for a more aggressive VC program. A strong X-Change will be essential if DHS starts down either path; beginning with the X-Change enables the broadest options for the future.

APPENDIX 1: SEMI-STRUCTURED INTERVIEW METHOD AND SELECTION CRITERIA

The HSI research team chose a qualitative research design and a semi-structured interview method to survey DHS stakeholders about a general USG VC concept. Semi-structured interviews are a qualitative method to collect information from stakeholders in exploring public policy questions.[159]

Stakeholder Selection and Data Collection From Interviews

The HSI team used a "purpose instance selection criteria" for choosing DHS stakeholders to interview.[160] The stakeholders were chosen "on purpose" based on how their knowledge about technology decisions and how their offices were "representative" within the DHS community. The DHS team interviewed staff from each office in DHS S&T (Plans, Programs and Requirements, Office of Research and Development, Homeland Security Advanced Projects Agency, and Systems and Engineering Development). We also interviewed stakeholders from the Domestic Nuclear Detection Office and the Office of State and Local Government Coordination and Preparedness. We spoke with at least one representative from many of the DHS components, such as Transportation Security Agency, Border and Transportation Security, Federal Emergency Management Agency, US Secret Service, US Coast Guard, and Immigration and Custom Enforcement.

Fifteen DHS stakeholders were interviewed between July and September 2005. The interview time averaged between 90 minutes and 2 hours. The interview discussion centered around new technology acquisition in DHS, views on barriers to adoption of new homeland security technologies, and opinions on a USG Venture Capital concept for DHS. During the interviews, we discussed the CIA's In-Q-Tel model as an example of the USG VC concept.

[159] United States Goverment Accountability Office, GAO/PEMD-10.1.5. July 1991. "Using Structured Interviewing Techniques."

[160] United States Government Accountability Office, GAO/PEMD-10.1.9. November 1990. "Case Study Evaluations," p. 23.

Table A.1: DHS Stakeholders Interviews, by DHS Directorates, Componets and Offices

	Interview Number
DHS S&T Directorate	
Plans, Programs and Requirements	1
Office of R&D	2
HSARPA	3, 4 and 5
SED	6
DHS Components	
TSA	7
BTS	8
FEMA	9
USSS	10
USCG	11
ICE	12
Other DHS Offices	
DNDO	13
Office of State and Local Government Coordination and Preparedness	14, 15

Data Analysis Technique

There are 2 basic models of data analysis for qualitative research methods: pattern matching (theory, then data) and explanation building (data, then explanation).[161] Since the semi-structured interview method is exploratory, the HSI team chose the explanation building analysis. The HSI team started with

[161] United States Goverment Accountability Office, GAO/PEMD-10.1.9. November 1990. "Case Study Evaluations," p. 63-64.

interview material, and then developed a picture of what was being described in the interviews and why. The interview data were used to fill in the initial "hunches," to change them, and to elaborate on them. The interview material has been written for this report in a nonattribution style.

Because the HSI team used a qualitative semi-structure interview method, it is accurate to say that our interview research results are representative, but not generalizable to the entire DHS community.

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APPENDIX 2: COMPARISON OF VENTURE CAPITAL FUNDS

COMPARISON OF VENTURE CAPITAL FUNDS

	Agency	Office	Name	Started	Type	Funding Sources	Total Size	Leverage	Portfolios	Deals	Tech Transfers	Performance	Head	Employees	Budget	Other
Direct Investment	CIA		In-Q-Tel	February 1999	Independent, 501(c)(3) non-profit enterprise; QIC translates needs to CIA	Largely CIA	Has invested $100 million	$1:$3 public: private	80 active; 10 projects at university labs	Range is usually $500,000 to $3 million; $60 million a year	100	75% successful	Gilman Louie, President and CEO	66		20% to 40% of employees' salary goes into a mandatory fund
Direct Investment	NGA	Communications and Electronics Command (CECOM) at Fort Monmouth	Rosettex Venture Fund	June 2001; Rosettex won contract February 2002	Rosettex Technology and Ventures Group is a for profit company and joint venture of Saranoff Corporation and SRI International; Rosettex Venture Fund is an independent Limited Liability Corporation (LLC)	Investments from fees under NTA contract; five year Other Transaction contract up to $200 million; projected to total $50 million within 10 years				No deals			Mark Lister, Managing Director	6 to 7 FTEs and 75 overseeing partners		75% of growth and original investment reinvested when equity position ends
Direct Investment	Army		OnPoint	Awarded to Rosettex in October 2002; first investment in November 2003	Non-profit entity (statutory requirement) managed by MILCOM	Army; 25% "tax" on R&D budget; $12.6 in FY03, $10 million in FY04$	$24 million		8 companies			Battery additive saved the Army $75 million	Strategic Advisory Board has very senior DoD officials	MILCOM has 20+ employees		
Direct Investment	NASA	Integrated Financial Management System (IFM)	Red Planet Capital	2004 as Mercury Fund	NASA has sufficient statutory authority to pursue VC activities	NASA funds and private firms							Owen Barwell, Lead			Little information released
Direct Investment	USDA		Alternative Agricultural Research and Commercialization Corporation (AARCC)	March 1992	Independent entity within USDA	Seed capital and early stage investments funded by USDA	Invested $28.1 million; attracted $112.0 million	$1:$5 public: private	Funded 66 companies			75% not performing; of $27 million $20+ loss				Legal entity but "moribund"; IG found serious trouble in 1999 and not funded in FY2000
Information and Collaboration	Navy	Commercial Technology Transition Office (CTTO) of Office of Naval Research (ONR)	VCs@Sea of Space and Naval Warfare Systems (SPAWAR) and NRAC VC Panel	Early 2004		Works with VCs			124 companies	57 deals total $212 million	5		Mark Lister, Managing Director of Rosettex, Chairman of Panel	10	$1 million	
Information and Collaboration	DoD	Office of Force Transformation (OFT)	Defense Venture Catalyst Initiative (DeVenCI)	Late 2002	Does not make direct investments	Works with VCs					13 so far and another 10 under evaluation as of mid-2004		Steven King, Director			Experimental program has ended but work is underway to make it permanent
Technology Transfer	DOE	Sandia Corporation	Technology Ventures Corporation (TVC)	1993	Non-profit subsidiary of Lockheed Martin	LM contribution of $1.9 million; $1.0 million froom DOE annually						$516 million VC money attracted; 68 new companies creating 6260 new jobs			$2.2 billion contract generating $15 million fee	
Technology Transfer	DOE	Oak Ridge National Laboratory	Battelle Ventures LLP	August 2003	Privately funded technology transfer program		Reportedly at $150 million									
Financial Risk	SBA		Program for Investment in Microentrepreneurs (PRIME)		Makes grants to qualified organizations	SBA										
Financial Risk	SBA		Small Business Investment Companies (SBIC)	1958	VCs can supplement their investments by borrowing at discounted government rates; individual funds are for-profit	SBA	At end of FY03 $5.5 billion; another $3.7 in available commitments	$1:$2 public: private	435 funds	Minimum is $5 million for bond fund and $10 million for equity fund; most range from $30 million to $170 million						
Financial Risk	SBA		New Markets Venture Capital (NMVC)		Bond guarantees	SBA										For economic development in low-income areas; focus is on job creation not new technology

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ABBREVIATIONS

Abbreviation – **Meaning**

AARCC – Alternative Agricultural Research and Commercialization Corporation

ACE – Angel Capital Electronic

AFMC – Air Force Materiel Command

AFRL – Air Force Research Lab

AIIC – Army Innovation Investment Corporation

AMC – Army Materiel Command

ANSER – Analytic Services Inc.

ASA/ALT – Assistant Secretary of the Army/Acquisition, Logistics and Technology

ATC – Applied Technology Council

ATS – Advanced Technology Showcase

BAA – Broad Agency Announcement

BENS – Business Executives for National Security

BRAC – Base Realignment and Closure

CALPERS – California Public Employees Retirement System

CECOM – Communications and Electronics Command

CIA – Central Intelligence Agency

CONOPS – Concept of Operations

CRADA – Cooperative Research and Development Agreement

CRRA – Capabilities Review and Risk Assessment

CRS – Congressional Research Service

CTTO – Commercial Technology Transition Office

DARPA – Defense Advanced Research Projects Agency

DCI – Director of General Intelligence

DeVenCi – Defense Venture Catalyst Initiative

DFARS – Defense Federal Acquisition Regulation Supplement

DIA – Defense Intelligence Agency

DoD – Department of Defense

DoE – Department of Energy

DHS – Department of Homeland Security

FACT – Food, Agriculture, Conservation and Trade Act of 1990

FAR – Federal Acquisition Regulation

FAIR – Federal Agricultural Improvement and Reform Act of 1996

FBI – Federal Bureau of Investigation

FCS – Future Combat Systems

FFRDC – Federally Funded Research and Development Centers

FTE – Full-time Employee

GAO – Goverment Accountability Office

GIS – Geographic Information Systems

GOCO – Government Owned Contractor Operated

HAC – House Appropriations Committee

HSARPA – Homeland Security Advanced Research Projects Agency

HSI – Homeland Security Institute

IA&E – Independent Assessment and Evaluation

IC – Intelligence Community

IDA – Institute for Defense Analyses

IG – Inspector General

IP – Intellectual Property

IPR – Intellectual Property Right

IRR – Internal Rate of Return

IT – Information Technology

LLC – Limited Liability Corporation

LM – Lockheed Martin

M&O – Management and Operation

MVC – MILCOM Venture Creation

NAPA – National Academy of Public Administration

NASA – National Aeronautics and Space Administration

NGA – National Geospatial-Intelligence Agency

NIMA – (now NGA)

NMVC – New Markets Venture Capital

NNSA – National Nuclear Security Administration

NRAC – Naval Research Advisory Committee

NRO – National Reconnaissance Office

NSA – National Security Agency

NTA – National Technology Alliance

ODUSD(S&T) – Office of the Deputy Under Secretary of Defense for Science and Technology

OFT – Office of Force Transformation

ONR – Office of Naval Research

OT – Other Transaction

OTA – Other Transaction Authority

OUO – Official Use Only

PEO – Program Executive Officer

PPP – Public Private Partnership

PRIME – Program for Investment in Microentrepreneurs

QIC – In-Q-Tel Interface Center

R&D – Research and Development

RFP – Requests for Proposal

RTAP – Rapid Technology Application Program

S&T – Science and Technology

SAB – Scientific Advisory Board

SBA – Small Business Administration

SBDC – Small Business Development Centers

SBIC – Small Business Investment Companies

SBIR – Small Business Innovation Research

SPAWAR – Space and Naval Warfare Systems Center

TCA – Tech Coast Angels

TRADOC – Training and Doctrine Command

TRC – Technology Research Collaborative

TVC – Technology Ventures Corporation

UNS – Urgent Needs Statement

USAF – United States Air Force

USDA – United States Department of Agriculture

USG – United States Government

USG VC – United States Government Venture Capital

VC – Venture Capital

X-Change – DHS VC Exchange

2900 South Quincy Street • Suite 800 • Arlington, VA 22206-2233