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THESIS

**ANALYSIS OF FOR-PROFIT COMMERCIAL FIRM
PARTICIPATION IN TECHNOLOGY INVESTMENT
AGREEMENTS**

by

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Thesis Advisor

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**ANALYSIS OF FOR-PROFIT COMMERCIAL FIRM PARTICIPATION IN
TECHNOLOGY INVESTMENT AGREEMENTS**

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Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

Beginning in World War II and throughout the Cold War, the U.S. military was a worldwide technological leader. Then, as the Cold War ended, dynamic changes began to occur in the world. Threats, budgets, the technological environment, and the industrial environment all began to change. These changes impacted the military's ability to maintain technological superiority over its adversaries, which was the foundation of a successful U.S. national defense. Commercial research and development (R&D) began to greatly surpass military R&D. For success on future battlefields, military capabilities had to effectively leverage advancing commercial technologies. Therefore, to allow for more commercial-friendly R&D agreements, regulations granting the use of other transactions (OTs) for basic, applied, and advanced research were issued. These research OTs evolved into what is now known as the Technology Investment Agreement (TIA). This study analyzes the Department of Defense's (DoD's) use of TIAs to determine if TIAs have attracted for-profit commercial firms into the defense market, thus allowing DoD to tap into the commercial market's R&D and technology base. DoD Inspector General audits and Dual Use Science and Technology (DU S&T) Program projects from 1997 through 2001 were reviewed. It was found that TIAs have attracted commercial firms, but not to the extent claimed by some Government organizations.

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I. INTRODUCTION

A. GENERAL

The Department of Defense (DoD) was the major buyer of technology during the Cold War. As a result, the military was assured access to leading edge technologies. [Ref. 1: p. 3] In fact, the military's technological requirements and ample availability of funding fostered the establishment of the Defense Industrial Base (DIB). The DIB provided the means to equip large numbers of military forces engaged in constant confrontation with a well-equipped adversary. [Ref. 2: p. 9]

Then, in the mid 1980s as the global picture began to change, part of the DIB foundation began to erode. Defense spending began to decline. The decline began in 1985. The entire defense budget was decreased, but defense procurement reductions were the most severe. Between fiscal year (FY) 1985 and FY 1996, defense spending declined 40% while defense procurement spending declined 65%. [Ref. 2: p. 8] The procurement budget decreased from \$136 billion to \$42 billion in FY 1996 dollars. [Ref. 1: p. 2] As a result, the DIB shrank to match the resources available from its primary customer. Hundreds of companies left the defense market or became part of the avalanche of mergers and acquisitions that significantly reduced the number of prime defense contractors. [Ref. 2: p. 1] In the overall downsizing effort, over two million jobs were eliminated from the defense market. [Ref. 2: p. 1]

While this downsizing was occurring, demands on the military forces did not decline and demand for weapons systems with the most advanced technology remained high. The Assistant Secretary of the Navy for Research, Development and Acquisition realized the military had to be at the head of the technological revolution or else the military would be vulnerable to it. [Ref. 3: p. 1] Congress, however, did not fund the DoD at an adequate level to keep pace with technology. The commercial sector began to lead the way in innovation. [Ref. 4: p. 2] The military began to find itself on the trailing edge rather than the leading edge of technology.

DoD research and development (R&D) expenditures were greatly surpassed by the rapidly expanding commercial market. Private sector R&D spending began to soar. From 1960 to 1999, private sector R&D spending increased from one-third to two-thirds of the country's total. During the same period, military R&D spending dropped from

53% to 16%. [Ref. 4: p. 3] Military leaders realized the military would have to rely more heavily on commercial technology.

For success on future battlefields, military capabilities have to effectively leverage rapidly advancing commercial technologies. By using commercial technologies, the military benefits from competitive pressures and market-driven efficiencies inherent in the commercial marketplace; and the pace at which technological improvements are incorporated into defense systems increases while the systems' costs decrease. [Ref. 5: p. 1]

In an effort to allow for more commercial-friendly R&D agreements, the Pentagon issued regulations in 1991 granting the use of Other Transactions (OTs). [Ref. 4: p. 4] OTs give greater flexibility to negotiate terms and conditions because OTs are not required to comply with the Federal Acquisition Regulation (FAR) or its supplements. Between 1991 and 1996, OTs for basic, applied, and advanced research projects evolved into what is now known as the Technology Investment Agreement (TIA). [Ref. 6; p. 1] A primary goal of TIAs is to support and stimulate defense research with for-profit commercial firms, allowing DoD to leverage, for defense purposes, the financial investments in technology made by those firms. [Ref. 6: p. 1]

B. RESEARCH OBJECTIVE

The purpose of this thesis is to provide a comprehensive analysis of DoD's use of TIAs in an effort to determine if TIAs have attracted for-profit commercial firms into the defense market, thus allowing DoD to tap into the commercial market's R&D and technology base.

C. RESEARCH QUESTIONS

1. Primary Research Question

Has the introduction of Technology Investment Agreements (TIAs) attracted for-profit commercial firms into the defense market?

2. Secondary Research Questions

Additional research questions are as follows:

What is a Technology Investment Agreement?

How are Technology Investment Agreements structured?

Who are the primary users of Technology Investment Agreements?

What are the benefits and drawbacks of using Technology Investment Agreements?

D. SCOPE AND METHODOLOGY

Title 10 United States Code, Section 2371 grants authority to enter into OTs, transactions other than contracts, grants, or cooperative agreements. The Department of the Navy (DoN) generally uses two types of OTs. The first is for prototype projects directly related to weapons or weapons systems DoD proposes to acquire or develop. [Ref. 7: p. 1] They are typically known as OTs for Prototype Projects or Section 845 OTs because Section 845 of the National Defense Authorization Act for Fiscal Year 1994 (Public Law 103-160) initially authorized their use. The second type of OT used by the DoN is for basic, applied, and advanced research projects. They are generally used to enter into dual-use research projects. [Ref. 7: p. 1] This second type of OT is now known as a Technology Investment Agreement (TIA).

The TIA evolved from types of cooperative agreements and OTs used by the Military Departments and the Defense Advanced Research Projects Agency (DARPA). The Military Departments and DARPA were using two different types of instruments for basically the same purpose, which became confusing. Therefore, on 2 December 1997, the Director of Defense Research and Engineering (DDR&E) issued guidance merging the two types of agreements into a single class of assistance instrument called TIAs. [Ref. 6: p. 1] The scope of this thesis is limited to TIAs entered into between Fiscal Years 1997 and 2001.

To gain a better understanding of the legislative intent of TIAs and the environment in which TIAs were created, the researcher first reviewed relevant literature, including but not limited to:

1. References, publications, and electronic media available at the Naval Postgraduate School.
2. Published Government reports, magazine articles, and research papers.
3. DOD and academic Internet websites and homepages.

To determine if TIAs attracted for-profit commercial firms to the defense market, the researcher analyzed reports from the DoD Inspector General and participants of the Dual Use Science and Technology (DU S&T) projects.

E. ORGANIZATION

This thesis is divided into five chapters. Chapter I, the introduction, identifies the focus of the thesis, states the research questions, and discusses the author's research scope and methodology. Chapter II presents background information on the United States military's operating environment both during and after the Cold War. The chapter also discusses the United States military's vision for the 21st century. Chapter III describes the history and legislative intent of OTs, TIAs, and the DU S&T program. The chapter also provides information on TIA structure. Chapter IV analyzes the data collected regarding TIAs. And lastly, Chapter V provides the study's principle conclusions and recommendations.

F. BENEFITS OF THE STUDY

This thesis is primarily intended to benefit the drafters and users of TIAs, which are DoD R&D activities and the Office of the Under Secretary of Defense (Acquisition, Technology, & Logistics). A critical review of the DoD's ability to attract for-profit commercial firms into the defense market by using TIAs could yield valuable information about TIAs as an innovative assistance instrument and their benefit to the Federal Government.

II. BACKGROUND

A. INTRODUCTION

Historical events have always influenced the United States' perception of its defense needs, which, in turn, have influenced the nation's commitment to maintaining defense supplies and manufacturing capacity. [Ref. 8: p. 1]

Throughout history, defense requirements have always been an important stimulus to technological advance. The U.S. military became one of the world's most significant technology drivers during and after World War II. The U.S. military was both a primary sponsor of R&D and a primary customer of high-technology products. [Ref. 9: p. 49]

Numerous military R&D efforts provided both military and non-military benefits. Polythene, radar, antibiotics, computers, and atomic energy are just a few examples. [Ref. 9: p. 48] Civilian sector advances have frequently been spin-offs of defense related developments. In fact, U.S. Government investment in military R&D was an important contributor to U.S. economic growth because of commercial spin-offs. [Ref. 9; p. 49]

During the Cold War, the U.S. military continued to be a worldwide technological leader. The military used its technological superiority to offset potential advantages of its adversaries. [Ref. 10: p. 3] However, as the Cold War ended, dynamic changes began to occur in the world. Threats, budgets, the technological environment and the industrial environment all began to change. These changes impacted the military's ability to maintain technological superiority over its adversaries, which was the foundation of a successful U.S. national defense.

This chapter provides background information on changes to the DoD operating environment and changes to the military's vision for the future.

B. COLD WAR MILITARY ENVIRONMENT

During the Cold War, the world was bipolar - East versus West. There was no question of who the enemy was. It was the Soviet Union and it dominated all aspects of U.S. military strategy and planning. The military's strategy to offset the Soviet Bloc's numerically larger forces was to maintain qualitative superiority in both the technology

of war and in the training and skill of its soldiers. [Ref. 2: p. 12] The strategy to maintain superior war technology created a demand for the development and deployment of technologically advanced weapons systems. That weapons system demand, coupled with the U.S. Government's fear of losing strategic advantage, pushed industry to push the advanced technology envelope and helped in the formulation of a unique Defense Industrial Base.

During the Cold War, two distinct industrial bases existed: the Defense Industrial Base (DIB) and the National Industrial Base (NIB). Prior to the Cold War, even through World War II, the U.S. did not have a distinct sector dedicated to supplying the Government weapons. [Ref 2: p. 12] Instead, during times of crisis, the Government would turn to the NIB for support. The nature of the Cold War, however, changed the way the Government did business. The Government believed a permanent state of confrontation required a permanent DIB for support. The Government invested heavily in the creation of production facilities, depots, and laboratories, many owned and operated by private companies and others Government-owned but contractor operated (GOCO). [Ref. 2: p. 12]

Over the decades of the Cold War, the Federal Government imposed standards, specifications and regulations on defense industries, increasing the divergence of the DIB and the NIB. The requirements levied on defense firms were imposed to support Government and national interests in socio-economic equity, competition in the marketplace, a close accounting of taxpayer's dollars, and the prevention of casualties through defective manufacturing. [Ref. 2: p. 13] The extra requirements imposed on the defense industry did not deter companies from entering the defense market. In fact, private companies interested in doing business with the DoD had little reason to remain in the NIB. Defense business was booming.

The military had little trouble arguing its case for new arms and equipment during the Cold War. The U.S. had a single adversary that was easily contemplated and readily exploited. Defense contractors constantly sought orders for new weapons systems and politicians in Congress were happy to oblige by providing the required funding. The politicians, wanting to stay in office, were trying to please their constituents by bringing work to the factories in their home states. It was a profitable system for the people involved. [Ref. 11: p. 2] The military got their weapons systems, the politicians stayed in office, and there was plenty of work for the public at large. The weapons system business was flourishing. All that began to change, however, in the late 1980s as the Cold War started to come to an end.

C. POST COLD WAR MILITARY ENVIRONMENT

The disintegration of the Soviet Union and the end of the Cold War had a profound effect on the military and its supporting industries. [Ref. 8: p. 6] Visions of a less militarized world accompanied the end of the Cold War. Without the Soviet threat, the public at large thought national defense spending should markedly decrease and provide funding to redress America's social ills. [Ref. 12: p. 1] That made the level of expenditures typical of previous defense budgets politically unsupportable.

Defense allocations plummeted. The military had to make large force reductions and significant retrenchments in R&D and procurement just to stay within funding constraints. [Ref. 8: p. 6] Defense budgets declined from a peak of 27 percent of all Federal funding in 1986 to 16 percent in 1998. [Ref. 12: p. 1] In 2000, R&D spending was down 30 percent from its inflation-adjusted peak in 1989. [Ref. 4: p. 3]

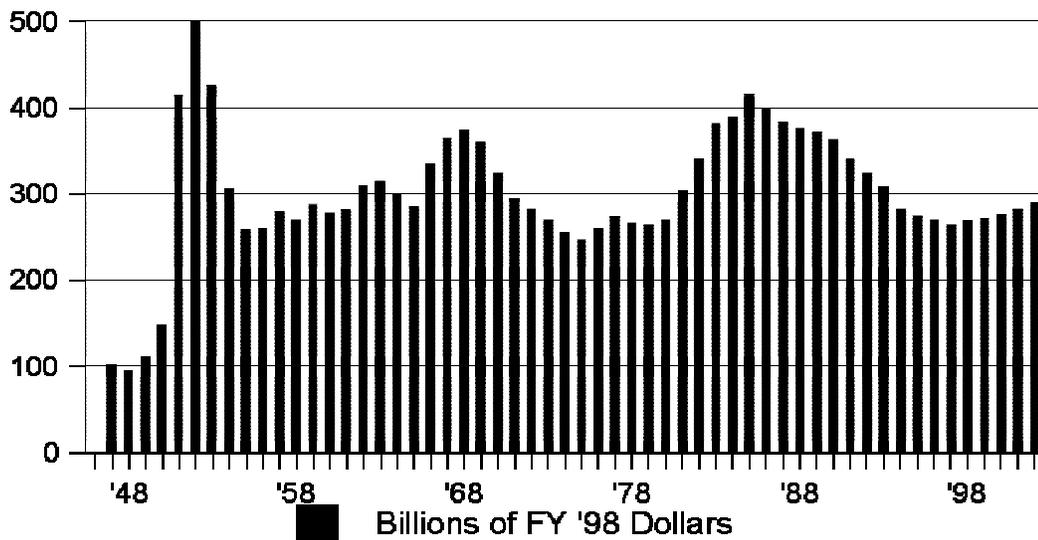


Figure 1: U.S. Military Spending 1946-2002 [Ref. 13:p.1]

The significant reductions in the defense budget left the DIB with massive overcapacity. The DIB had to shrink to match its available resources. Defense industries

responded by: first, consolidating existing production facilities and capabilities; and second, by re-engineering themselves. [Ref. 2: p. 9]

In 1991, there were over \$300 million worth of military industry mergers. [Ref. 1: p. 2] In the aerospace sector, over forty companies were consolidated into three: Lockheed Martin, Boeing, and Raytheon. [Ref. 2: p. 9] Other defense sectors, such as munitions, armored vehicles, and small arms, all experienced similar consolidations. Company objectives of the consolidations were to maintain a critical mass of defense related business while diversifying into commercial goods production, minimizing their reliance on the defense budget. [Ref. 8: p. 6]

A significant problem with the reduced defense budgets was that the end of the Cold War did not reduce the requirements of the military. Actually, quite the opposite happened. The end of the Cold War ushered in an era of limitless uncertainty and incalculable risks. [Ref. 11: p. 4] There was major growth in the number of overseas crises to which U.S. military forces responded. The military was used more than at any other time, playing a more active role in support of U.S. foreign policy. [Ref. 12: p. 2]

Unfortunately, DoD did not have enough funding to do everything it wanted to do. The DoD chose to concentrate on maintaining force readiness and quality of life. Minimal expenditures were made on force modernization. As a result, the military's status as a technological leader slipped and commercial industry quickly picked up the slack. Commercial industry became the technology innovation leader. In 1998, the U.S. Patent Office issued 66,062 patents to commercial companies, a 50 percent increase over 1971. In contrast, the armed services only received 585 patents in 1998, a decrease of 46 percent from 1971. [Ref. 4: p. 2]

With the end of the Cold War the military was faced with incredible challenges. How should the U.S. counter the uncertain threats of the future? What was the best way to stay ahead of modernizations undertaken by U.S. adversaries?

D. MILITARY VISION FOR THE 21ST CENTURY

The U.S. military must be prepared to conduct multiple, concurrent, contingency operations worldwide. It must be able to do so in any environment, including one in which an adversary uses asymmetric means, such as nuclear, biological, or chemical weapons. U.S. forces must be organized, trained, equipped and managed with multiple missions in mind. [Ref. 14: p. 1]

The military was operating in never before seen territory. It became clear that the framework that had guided U.S. military strategy during the Cold War was inadequate for the future. [Ref. 15: p. 1] U.S. defense policies and alliances had to adapt to meet the fast-moving changes at home and abroad. [Ref. 15: p. 3] A revolution in military affairs had to occur. According to Andrew Marshall, director of the Office of Net Assessment in the Office of the Secretary of Defense:

A Revolution in Military Affairs (RMA) is a major change in the nature of warfare brought about by the innovative application of new technologies, which, combined with dramatic changes in military doctrine and operational and organizational concepts, fundamentally alters the character and conduct of military operations. [Ref. 16: p. 1]

DoD's strategy for managing post Cold War dangers had three basic lines of defense. The first was to prevent threats from emerging; the second was to deter threats that did emerge; and if both prevention and deterrence failed, the third line of defense was to defeat the threat with military force. Executing that strategy required the U.S. to maintain a strong, ready military force equipped with a well-integrated, flexible mix of the most advanced technologies. [Ref. 16: p. 1] However, mere technological superiority was not the goal. Full spectrum dominance – maintaining a force capable of dominating any potential enemy across the full spectrum of military operations – was the goal. As expressed in the Chairman of the Joint Chiefs of Staff Joint Vision 2010, full spectrum dominance is a key characteristic of the U.S. Armed Forces of the 21st century. [Ref. 16: p. 4]

E. SUMMARY

During the Cold War, the U.S. military was the world's technological leader. A permanent DIB formed to support the high demand and ample funding was available from the armed services. As the Cold War ended, the situation changed. The single adversary that had threatened the U.S. was replaced by limitless uncertainty and incalculable risk. DoD budgets were dramatically slashed. The DIB shrank proportionally to the reduced budgets. DoD was unable to pursue technology as vigorously as it had in the past due to the reduced budgets, and commercial industry replaced the U.S. military as the technology innovation leader. The DoD knew it had to

change its business practices and goals in response to the changes in the military and world environment. Technological superiority alone was no longer sufficient and Full Spectrum Dominance became the mantra.

Maintaining technological superiority was still important because technological superiority was an essential facet of full spectrum dominance, but in the era of reduced budgets, DoDs challenge was to figure out a way to maintain technological superiority at a reasonable price. The DoD could no longer continue its Cold War ways of obtaining technological superiority at any cost. Superior weapon system performance had to be made more affordable. The DoD had to pursue technology in new ways. The DoD had to take advantage of commercial technology innovations and reap the benefits of the large commercial market's economies of scale. [Ref. 16: p. 2]

III. ATTRACTING FOR-PROFIT COMMERCIAL FIRMS TO THE DEFENSE MARKET

A. INTRODUCTION

The Defense Department's future technological superiority is in jeopardy if it can't effectively leverage our commercial industry. [Ref. 4: p. 2]

As the Cold War ended, a revolution was taking place in technology. Commercial industry seized on the new technologies and began a process of technological and organizational innovation that greatly surpassed the military. [Ref. 2: p. 16] The military did not have the funding available to keep pace. Military Research and Development (R&D) spending plummeted while the private sector's R&D expenditures soared. In 1999, private sector R&D accounted for 67 percent of the country's total, while the military only accounted for 16 percent. [Ref. 4: p.3]

The lack of defense funding, coupled with the advent of the technological revolution, greatly affected the Defense Industrial Base (DIB). The lack of funding, plus the extra standards, specifications and regulations imposed on defense industries, hampered defense contractors and limited the entry of potential commercial producers. [Ref. 2: p. 13] To survive, defense companies had to restructure themselves and create opportunities to move into new, non-defense and even non-government markets. [Ref. 2: p. 16]

In the absence of a Cold War magnitude threat, affordability became a more prominent consideration in new weapons system development. The DoD needed the technological innovations of commercial industry, but they did not have the money to pay for it. Plus, DoD overburdened commercial industry with paperwork. The acquisition system, as it existed, created a counterproductive, unnecessary and undesirable segregation between defense and commercial businesses. [Ref. 2: p. 14] To attract firms back into the defense industry, Pentagon officials knew they would have to make changes.

B. OTHER TRANSACTION AUTHORITY (OTA)

The Defense Advanced Research Projects Agency (DARPA, formerly known as ARPA) is DoD's primary R&D organization. It manages and directs selected DoD basic and applied R&D projects, pursuing research and technology where risk and payoff are very high, and where success may provide dramatic advances for traditional military roles and missions. [Ref. 17] It was DARPA that first recognized the need for alternate contractual approaches to facilitate tapping into the private sector's technology explosion. DARPA sought an approach that was more flexible in negotiating terms and conditions than the standard Federal Acquisition Regulation (FAR) contract or cooperative agreement. In 1989, Congress responded by enacting 10 U.S.C. 2371. It established a 2-year test program with DARPA authorizing the use of "other transactions" for basic, applied, and advanced research projects.

"Other transactions" (OTs) is a term commonly used to refer to transactions other than contracts, grants, or cooperative agreements. OTs are not required to comply with the FAR, its supplements, or laws relating to contracts, grants, or cooperative agreements. With those requirements lifted, other transaction authority (OTA) provides tremendous flexibility to negotiate terms and conditions, which was exactly what DARPA wanted. [Ref. 7: p. 1]

The test program worked so well that the authority provided in 10 U.S.C. 2371 was extended to all military departments in the fiscal year (FY) 1992 Defense Authorization Act. The Act, however, did add new constraints on both DoD and DARPA. The 1992 Defense Authorization Act stated:

1. OTs should normally be issued to a consortium consisting of private companies, not-for-profit agencies, and Government organizations.
2. To the maximum extent practical, Government funding of research could not exceed that provided by the non-Government parties.
3. The Government agency issuing the OT had to ensure the research did not duplicate research already being performed.
4. OTs should only be used when a standard contract, grant, or cooperative agreement was not feasible or appropriate. [Ref. 18: p. 2]

The evolution of OTA was just beginning. OTA changed again with Section 845 of the FY 1994 Defense Authorization Act. On a 3-year trial basis, OTA was expanded,

allowing DARPA to use OTs for prototype projects that were directly relevant to weapons or weapons systems. [Ref. 19: p. 5] Then, Section 804 of the FY 1997 Defense Authorization Act expanded Section 845 authority to include the Military Department Secretaries and other officials designated by the Secretary of Defense and extended the authority to 30 September 1999. Section 804 also stipulated that OTs for prototype projects, as opposed to OTs for basic, applied, and advanced research, would not require cost sharing by the research participants, could be used even when a traditional contract was feasible or appropriate, and had to be awarded using competitive procedures. [Ref. 18: p. 2]

OTA had evolved into two distinct types of OTs. The first type was an OT used to carry out basic, applied, or advanced research projects. These OTs were considered assistance instruments and were authorized under the permanent authority given by 10 U.S.C. 2371. The Defense Grant and Agreement Regulatory System (DGARS) governed awards made for assistance or other non-acquisition purposes using 10 U.S.C. 2371.

Between 1991 and 1996, DARPA primarily used a type of research OT called a consortium agreement. After 1992 when the Military Departments were given research OT authority, they began to use a type of cooperative agreement. Although the format was different, both instruments were using the authority provided by 10 U.S.C. 2371 and the agreements were specifically tailored to eliminate barriers to commercial firms. On 2 December 1997, after determining that having two very similar agreements with different names was confusing, the Director of Defense Research and Engineering (DDR&E), who was responsible for managing research OTs, issued guidance merging the two types of agreements into a single class of instrument called a TIA. [Ref. 6: p.1]

TIA guidance was updated via memorandum on 24 March 1998 (Revision 1) and again on 3 February 1999 (Revision 2) in response to legislative changes and lessons learned using the agreements. [Ref. 20: p. 2] Then, on 30 April 2002, the Secretary of Defense proposed adding a new part to the DoD Grant and Agreement Regulations (DoDGAR) to incorporate the policies and procedures for award and administration of TIAs. This new part would create a comprehensive and stand-alone discussion of TIAs, providing clear policy and procedural guidance distinguishing TIAs from other assistance agreements. It was the first step toward putting in place TIA rules of a more permanent nature. [Ref. 21: p. 21486]

The second type of OT was for prototype projects. These OTs were temporarily authorized under Section 845 of the FY 1994 National Defense Authorization Act (PL 103-160). This type of OT, commonly referred to as a Section 845 OT, was classified as

an acquisition instrument. [Ref. 22: p. 9] The Director of Defense Procurement (DDP) was given the responsibility of managing Section 845 OTs. [Ref. 23: p. 2]

Section 803 of the Floyd D. Spence National Defense Authorization Act for FY 2001 (PL 106-398) extended DoD's Section 845 OT authority to 30 September 2004. Section 803 also established new conditions for the appropriate use of Section 845 OTs. Specifically, a prototype project cannot be initiated under that authority unless:

1. there is at least one non-traditional defense contractor participating to a significant extent in the prototype project; or
2. no-nontraditional defense contractor is participating to a significant extent in the project, but at least one of the following circumstances exists:
 - a. at least one-third of the total cost of the prototype project is paid out of funds provided by parties to the transaction other than the Federal Government; or
 - b. the senior procurement executive for the agency determines in writing that exceptional circumstances justify the use of this transaction. [Ref. 22: p. 9]

C. TECHNOLOGY INVESTMENT AGREEMENTS

As previously stated in Chapter I, this thesis focuses on DoD's use of research OTs known as TIAs. TIAs should only be used when the principal purpose of the project is stimulation or support of research, not the acquiring of goods or services for Government benefit. [Ref. 24] As with other assistance agreements, TIAs' ultimate goal is fostering the best technologies for future defense needs. Although TIAs differ from other assistance agreements, they also complement them because they address the technology goal by fostering civil-military integration in DoD Science and Technology (S&T) programs. [Ref. 21: p. 21496]

As per 10 U.S.C. 2501, civil-military integration is a national policy objective. Achieving civil-military integration would mean DoD could draw upon a single, national technology and industrial base to meet its needs. [Ref. 21: p. 21515] In support of civil-military integration, TIAs are designed to:

1. Reduce barriers to commercial firms' participation in defense research, giving DoD access to the broadest possible technology base.

2. Promote new relationships among performers in both the defense and commercial sectors of the technology and industrial base.
3. Stimulate performers to develop, use and disseminate improved practices. [Ref. 21: p. 21496]

Increasing access to commercial firms, creating new relationships, and promoting better business practices should benefit DoD in numerous ways. For example, DoD's technological sophistication should increase. Technology in the commercial marketplace is often more advanced than technology available in the defense-specific sector. DoD benefits from access to that technology. Also, the commercial market has a much larger business volume for high-technology products and processes. DoD should be able to take advantage of the commercial market's economies of scale, thus experiencing reduced life-cycle costs for buying, operating, and maintaining weapons and their support systems. [Ref. 21: p. 21516]

D. TIA STRUCTURE

The patent-rights provisions determine the type of instrument to be used for a TIA. TIAs may either be a type of cooperative agreement or a type of assistance transaction other than a grant or cooperative agreement. If the patent-rights provisions comply with the Bayh-Dole Act (35 U.S.C. 202-204), the TIA is a type of cooperative agreement. If the patent rights are less restrictive than the Bayh-Dole Act, the TIA becomes a type of assistance transaction other than a grant or cooperative agreement. [Ref. 21: p. 21516]

The Bayh-Dole Act allows non-governmental organizations to retain title to inventions in the performance of funding agreements with Federal agencies, while the Government retains a paid license. Under specific circumstances identified in the Act, the Government retains "march-in" rights to require a private party to grant a license for the technology. [Ref. 25: p. 3] The following table summarizes the distinction between the two TIA variants.

	The TIA's provision complies with Bayh-Dole	The TIA's patent provision varies from what patent is possible under Bayh-Dole
The TIA does not include recovery of funds provision.	The TIA is a type of cooperative agreement under 10 U.S.C. 2358(b)(1).	The TIA is a type of assistance transaction other than a grant or cooperative agreement under 10 U.S.C. 2371.
The TIA includes recovery of funds provision.	The TIA is a type of cooperative agreement under 10 U.S.C. 2358(b)(1). It uses recovery of funds authority of 10 U.S.C. 2371.	The TIA is a type of assistance transaction other than a grant or cooperative agreement under 10 U.S.C. 2371. It also uses recovery of funds authority of 10 U.S.C. 2371.

Table 1: TIA Instrument Types and Statutory Authority [Ref. 21: p. 21516]

The TIA agreements officer does not need to decide while negotiating the agreement terms and conditions whether the TIA should be a cooperative agreement or an assistance transaction other than a grant or cooperative agreement. That decision should be made with the assistance of legal counsel when the agreement is finalized. The agreement patent provisions should be compared with the Bayh-Dole Act requirements to make the determination. It must be remembered that most Bayh-Dole Act requirements only apply to small businesses and non-profit organizations and that a non-formally incorporated consortium is neither considered a small business nor a non-profit organization. [Ref. 21: p. 21516]

A DARPA sample TIA agreement is provided in Appendix A. It is a consortium agreement that complies with the provisions of the Bayh-Dole Act. Hence, the TIA is a type of cooperative agreement.

E. DUAL USE SCIENCE AND TECHNOLOGY (DU S&T) PROGRAM

A technology is considered dual use if it has military utility and enough commercial potential to support a viable industrial base. Increased use of dual use technologies will allow the Services to take advantage of the competitive pressure and market-driven efficiencies that lead to accelerated development and cost savings in the commercial sector. Additionally, increased use of dual use technologies is essential to increase the performance, increase the sustainability, and reduce the life cycle costs of defense systems. [Ref. 26: p. 3]

The Dual Use Application Program (DUAP) created by the FY 1997 Defense Authorization Act was the genesis of the DU S&T Program. The first solicitation for dual use projects occurred in February 1997 as a Dual Use Science and Technology Initiative under the DUAP. Then Section 203 of the FY 1998 National Defense Authorization Act formally established the DU S&T Program to help increase the use of dual use technologies in defense systems. [Ref. 27: p. 1] The program had two primary objectives: to jointly develop dual use technologies with industry; and to make the development of dual use technologies with industry a standard way of doing business throughout the DoD. [Ref. 26: p. 3]

The Office of the Secretary of Defense (OSD) was required to maintain oversight of the DU S&T program. In April 1998, the DDR&E was named as the OSD official responsible for dual use programs. The office of the Deputy Under Secretary of Defense, Science and Technology (DUSD/S&T), which is within the office of the DDR&E, was ultimately given management and oversight responsibility for the program. [Ref. 27: p. 2]

The FY 2002 guidelines for the DU S&T Program increased the emphasis on attracting commercial firms to the Program. This change was consistent with the recommendations of an Independent Assessment, which was endorsed by the Under Secretary of Defense for Acquisition, Technology and Logistics (USD/AT&L). The FY 2002 minimum requirements for a dual use project are:

1. The project will result in the development of a dual use technology that addresses a military need and has sufficient potential commercial applications to support a viable production base.
2. At least 50 percent of the project cost is paid by non-federal participants, one of which is a for-profit company. (Under special circumstances an appropriate Service representative can waive the 50 percent cost share requirement.)
3. Award must be based on competitive procedures.
4. Projects must be awarded using TIAs or Section 845 OTs.
5. The project must result in the development of a technology, not the application of a technology. [Ref. 26: p.5]

The two key elements critical to the success of the DU S&T Program are the industry cost share and the use of TIAs, i.e., cooperative agreements or other

transactions. Industry cost share helps ensure the commitment to commercialization while the use of TIAs provides the Services greater flexibility, giving them the ability to attract commercial firms that would not normally do business with DoD, which gives them broader access to advanced technologies. [Ref. 27: p.2]

F. SUMMARY

Post Cold War, Pentagon officials knew they could not continue operating as usual. Commercial innovation and technology was greatly surpassing the military. In order to survive, DoD knew it had to leverage commercial industry. In 1989, Congress enacted 10 U.S.C. 2371 as a means to gain that commercial leverage. It was the birth of OTA.

OTA evolved throughout the years and ultimately provided two distinct types of OTs. The first type of OT is for basic, applied and advanced research. This type of OT is an assistance instrument known as a TIA. The second type of OT is for prototype projects. This type of OT is an acquisition instrument known as a Section 845 OT.

This thesis focuses on the TIA assistance instrument. As with other assistance instruments, TIAs foster development of the best technologies for future defense needs. However, TIAs are unique in that they also foster civil-military integration. In fact, TIAs are specifically designed to reduce barriers to commercial firms' participation in defense research to give DoD access to the broadest possible technology base. Also to help increase civil-military integration, the DU S&T Program was established in 1998. All DU S&T Program projects must be awarded using TIAs or Section 845 OTs.

TIAs and the DU S&T Program sound great, but they give rise to several questions. Specifically, are these initiatives really working? Have TIAs attracted commercial firms to the defense market, thus broadening DoD's technology base? These questions are answered in Chapter IV.

IV. ANALYSIS OF TECHNOLOGY INVESTMENT AGREEMENTS

A. INTRODUCTION

In 1989, Congress enacted 10 U.S.C. 2371, which authorized the use of “other transactions” for basic, applied, and advanced research. In 1999, ten years after the introduction of other transactions authority, the DoD Inspector General and the Defense Contract Audit Agency (DCAA) jointly conducted the first review of contractor costs charged to other transactions. In addition to reviewing the financial and cost aspects, the review also quantified the number of contractors participating in other transactions. The Inspector General developed a database in which participating contractors were classified as traditional or new based on whether the DCAA had performed incurred costs or other related reviews at the contractor’s location. The Defense Contract Action Data System (DD 350) was also searched to determine if the contractors had performed research or cost-type contracts with DoD. [Ref. 20: p. 3]

Guidance from the Director, Defense Research and Engineering (DDR&E) adopted the term Technology Investment Agreement (TIA) for research other transactions issued by the Defense Advanced Research Projects Agency (DARPA) and the Military Departments in late 1997. For simplicity, henceforth, the term TIA will be used for all research other transactions entered into from 1997 to the present.

As previously discussed, a primary goal of TIAs is obtaining services from the commercial sector that normally does not do business with the Government. The question still remains, based on that criterion, have TIAs been successful? To answer that question this chapter provides excerpts from, and analyzes data provided in, the 1999 DoD Inspector General audit. Additionally, this chapter analyzes TIA usage in the Dual Use Science and Technology (DU S&T) Program from its inception in 1997 through 2001.

B. INSPECTOR GENERAL AUDIT

According to the 1999 DoD Inspector General audit, the Military Departments and the Defense Advanced Research Projects Agency (DARPA) issued research other transaction as shown below.

	FY 1997	FY 1998	Total
Army	1	24 ³	25
Navy	1 ²	20	21
Air Force	1	7	8
DARPA	13	6	19
NSA ¹	0	1	1
Total	16	58	74
Value (millions)	\$148.6	\$499.3	\$647.9

Table 2: TIAs Issued [Ref. 20: p. 37]

Table 2 shows a significant increase in TIA usage between FY 1997 and FY 1998. Overall usage increased over 350 percent. Army, Navy, and Air Force participation increased 2400, 2000, and 700 percent respectively. Only DARPA, the first organization to use research other transactions, decreased its usage by 46 percent.

New and traditional contractor participation in TIAs is depicted in the chart below.

	1997	1998	Total
New Contractors (Net) ⁴	7	26	33
New Contractors (Total) ⁵	9	28	37
Traditional Contractors (Total)	31	77	108
Total Contractors	40	105	145

Table 3: TIA New and Traditional Contractor Participation [Ref. 20: p. 5]

¹ National Security Agency.

² The Navy issued 1 TIA that was not reported in the FY 1997 Annual Report to Congress.

³ For FY 1998, the Army Research Laboratory issued 1 FY 1997 TIA included in the FY 1998 count.

⁴ New contractors that had not done cost-based research and development with DoD previously. New contractors are counted only once even if they participated in more than one TIA.

⁵ Total of new contractors that had not performed cost-based research and development before. A new contractor is counted more than once if performing on more than one TIA.

Table 3 shows that new contractor participation also increased between 1997 and 1998. In fact, from 1997 to 1998, total new contractor participation increased over 300 percent. That is comparable to the overall increase in TIA usage. It must be noted, however, that traditional contractor participation also significantly increased. Traditional contractor participation increased nearly 250 percent. Thus, total new contractor participation as compared to traditional contractor participation was relatively constant.

In 1997, total new contractor participation accounted for 25.5 percent of the total contractors. In 1998, new contractor participation only slightly increased to 26.7 percent of the total contractors. The increase is basically negligible. The remaining approximately 74 percent of TIA participants were traditional defense contractors or non-profit universities or organizations.

Another interesting fact can be surmised from the information provided in the table below. Table 4 depicts the new contractor's dollar value share of TIAs entered into in FY 1997 and FY 1998.

	1997	1998	Total
New Contractors (Net) ¹	7	26	33
New Contractors (Total) ²	9	28	37
New Contractor Total (millions)	\$7.8 ³	\$99.2 ⁴	\$107
Total Contractor Share (millions)	\$79.5	\$243.6	\$323.1
Percentage of New Contractor Cost Share to Total Cost Share	10	41	26

Table 4: New Contractor Participation in TIAs [Ref. 20: p. 38]

Table 3 and Table 4 are closely related. Table 3 shows that total new contractor participation for 1997 and 1998 accounted for 26.1 percent of the total contractors. Table 4 shows that the percentage of new contractor cost share compared to total cost share for

¹ New contractors that had not done cost-based research and development before. New contractors are counted once even if they participated in more than one TIA.

² Total of new contractors that had not performed cost-based research and development before. ¹A new contractor is counted more than once if performing on more than one TIA.

³ One contractor contributed \$5.4 million, 69 percent of the \$7.8 million.

⁴ Two contractors contributed \$86.1 million, 87 percent of the \$99.2 million.

1997 and 1998 is 26 percent. The same percentage is derived from both tables. At first glance it appears as if everything is in alignment, but before any final conclusions are made, note 3 and note 4 of table 4 should be reviewed.

For 1997, Table 4, note 3, states that one new contractor contributed 69 percent of the total new contractor cost share. For 1998, Table 4, note 4, states that two new contractors contributed 87 percent of the total new contractor share. This shows that although new contractors participated, they did not equally share the cost burden of the research. The traditional contractors with the help of a select few new contractors contributed the bulk of the non-federal cost share. Should that be a concern? This researcher believes it should.

If new contractors do not begin to contribute more financially, this researcher believes traditional contractors will begin to become unwilling to partner with them on research projects. The traditional contractors would be assuming much more risk than the new contractors. New contractors would have to give some type of significant benefit to the traditional contractors in order for partnerships to continue.

Does this lack of overall new contractor financial contribution mean that TIAs are unsuccessful? This researcher does not think so. The April 2002 proposed guidance on TIAs states:

DoD Components use TIAs to support or stimulate defense research projects involving for-profit firms, especially commercial firms that do business primarily in the commercial marketplace. The new part therefore gives DoD agreements officers greater flexibility to negotiate award provisions in areas that can present barriers to those firms (e.g., intellectual property, audits, and cost principles). [Ref. 21: p. 21486]

As such, TIAs are supposed to get for-profit commercial firms involved in DoD business. Using this criterion and the information gathered from the 1999 DoD Inspector General audit, this researcher believes TIAs are a success. The above information shows over one-fourth of the TIAs entered into in 1997 and 1998 involved non-traditional defense contractors. But what would information from another source say, and how has the performance of TIAs been since 1998? To examine this, this research analyzed TIAs entered into via the DU S&T Program.

C. DU S&T TIAs

The objective of the DU S&T Program is to partner with industry to jointly fund the development of dual use technologies needed to maintain U.S. superiority on the battlefield. One measure of the Program's success is its ability to attract commercial firms that are often reluctant to do business with the DoD. A major incentive being used to attract commercial firms is the use of TIAs. The DU S&T Program Office believes the TIAs are working. In the Program's annual report to Congress, it is stated that of the 355 different non-federal partners participating in the program, 130 are commercial firms. [Ref. 27: p. 7] This researcher contacted the DU S&T Program Office and requested the documentation that supported that statistic. Unfortunately, they did not provide the information. So, this researcher conducted an analysis of the DU S&T Program information that was publicly available in order to verify the Program's claim.

A total of 215 Army and Navy DU S&T projects from 1997 through 2001 were reviewed. A quantitative summary of the project distribution is provided in Table 5 below.

	ARMY	NAVY	TOTAL
1997	36	13	49
1998	39	19	58
1999	27	18	45
2000	11	27	38
2001	19	6	25
Totals	132	83	215

Table 5: DU S&T Program TIAs Reviewed

Table 5 shows an interesting change from the findings of the 1999 DoD Inspector General audit report. The report looked at TIAs in 1997 and 1998 and accurately reported the quantity of TIAs was on the rise. Since that time, however, TIAs have been on the decline. The Army and Navy combined peak was in 1998 and steadily declined to its low in 2001.

The DU S&T Program claims 36.6 percent of non-federal participants in DU S&T projects are commercial firms. However, after analyzing the project participants, this

researcher does not agree with those findings. Of the 215 projects reviewed, 279 different participants were reviewed. A sampling of the project participants is contained in Appendix B. Of the participants, 177 (63.4 percent) were traditional defense contractors, 73 (26.2 percent) were commercial firms that do not normally do business with DoD, and 29 (10.4 percent) were educational and non-profit organizations. The difference between the DU S&T programs claim and this researcher's findings regarding commercial firms is 10.4 percent. It is interesting that the percentage is the exact percentage of educational/non-profit participants determined by the researcher. Did the DU S&T Program include educational establishments as commercial firms? If they did, this researcher believes that was done in error.

The DU S&T program also claims that program participation has increased within industry. The research both agrees and disagrees with that statement. From a participant variety perspective, the researcher does not agree with the statement. This relates to the information provided in table 5 above. It is true that from 1997 to 1998 as the number of DU S&T projects increased, the number of different firms participating in the projects also increased. Of the 107 projects reviewed for 1997 and 1998, the number of different participants increased from 51 to 74. Then, however, as the number of projects began to decrease, the number of different participants also decreased. By 2001, the variety of participants had decreased back down to 54, only three higher than the original participation rate.

Why this researcher does agree with the statement that the participation rate has increased is because in 1997, 49 projects were reviewed and there were 51 different participants. In 2001, a total of 25 projects were reviewed and there were 54 participants. The number of projects decreased by almost 50 percent, but the number of participants increased by three.

This researcher believes the increase in participation is primarily due to the increased use of consortiums. Of the 49 projects reviewed in 1997, only 14 were awarded to consortiums. In 2001, of the 25 projects reviewed, 14 were awarded to consortiums. Hence, the consortium award percentage nearly doubled from 28.6 percent in 1997 to 56 percent in 2001.

In reviewing the DU S&T projects, it was obvious that traditional defense contractors were originally the primary participants. In 1998, Bell Helicopter Textron and the Boeing Company were the dominant program participants. Of the 58 projects reviewed, Bell and Boeing were involved in 10 and 13 projects respectively. However, in 2001, of the 25 projects reviewed, Bell and Boeing were involved in only one program

each. Traditional defense contractors no longer dominated the landscape. Commercial firms like Advanced Technology Materials, Inc., Cephid, Inc., and Graphic Packaging Corporation became players.

D. SUMMARY

The original question was, have TIAs attracted commercial firms that normally do not do business with the government into participating in research projects with DoD? All the claims say that they have and after analyzing TIA data this researcher agrees. This researcher also believes the use of consortia for TIAs has increased commercial firm participation in TIAs. This researcher, however, does not believe Government organizations have accurately stated the effectiveness of TIAs in increasing commercial firm participation. This researcher believes the effectiveness has been overstated. The DU S&T Program claims a commercial participation rate of 36.6 percent but this researcher could only validate a 26.2 percent participation rate. Regardless, whether the participation rate is 36.6 or 26.2, it is clear TIAs have given DoD access to commercial firms that had previously been unwilling to do business with the government.

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V. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

The purpose of this study was to analyze DoD's use of TIAs to determine if TIAs have attracted for profit commercial firms into the defense market, thus allowing DoD to tap into the commercial markets R&D and technology base. This final chapter provides the researcher's principle conclusions. This chapter also presents recommendations based on the principle conclusions, provides answers to the research questions posed in Chapter I and suggests TIA areas for further research.

B. CONCLUSIONS

The background information and the data presented and analyzed in Chapter IV leads this researcher to draw several conclusions.

#1. TIAs provide a viable alternative to traditional research contracts.

The 1991 legislation authorizing the use of "other transactions" for basic, applied, and advanced research projects was enacted to provide a more commercial-friendly approach to R&D agreements. Other Transaction Authority (OTA) evolved into two distinct types of other transactions, one of which evolved into TIAs. TIAs do provide agreement officers greater flexibility in negotiating terms and conditions because TIAs are not required to comply with the Federal Acquisition Regulation (FAR) or its supplements. Since their introduction in 1997, several hundred TIAs have been awarded that have developed new and innovative technologies beneficial to DoD. One such example is provided in conclusion number two below.

#2. DoD has benefited from commercial firm participation in TIAs.

Commercial firms participate in TIAs alone or in consortiums. Either way DoD benefits from their participation. Thermal Spray Nanostructured Coatings is one example of a TIA benefit. The Thermal Spray Nanostructured Coatings was an Office of Naval Research (ONR) DU S&T project. The project won the DU S&T Achievement Award, which recognizes successful dual use projects and the individuals responsible for their

initiation and execution. One of the eligibility requirements for the award is that the project must be awarded competitively using a TIA.

Nanodyne Incorporated, a small commercial business, led a consortium in developing the highly wear and corrosion resistant ceramic composite coating for use on ships, aircraft, and land vehicles. The coating can be applied using existing industrial equipment and standard thermal spray processes. The primary benefit of the technology is a reduction in life cycle costs due to increased corrosion and wear protection. Additionally, the coatings are superior to hard chrome plating and are approximately 60 percent less expensive. Applications of this technology have already started. The coatings are being used on submarine air intake and exhaust valves. That application is expected to save \$400,000 per ship or \$20 million over the next ten years. [Ref. 28: p.1]

#3. TIA usage is declining.

Dual Use Science and Technology (DU S&T) projects are awarded using TIAs. The DU S&T Program was initiated in 1997. In 1998, combined Army and Navy DU S&T program usage increased, but since that time, usage has been on a steady decline. The researcher does not know the cause of the decline, but feels it is important to recognize a steady decline is occurring.

C. RECOMMENDATIONS

The following recommendations are based on the above conclusions.

#1. Make the June 2002 proposed TIA guidance permanent.

TIAs are a relatively new class of instrument. Currently TIA guidance is provided via memorandum from the Director, Defense Research and Engineering (DDR&E). On 30 April 2002 the Office of the Secretary of Defense proposed adding a new part to the DOD Grant and Agreement Regulation (DoDGAR) to incorporate the policies and procedures for award and administration of TIAs. This researcher believes the proposed guidance should be adopted and made permanent. The new regulation would provide clear policy and procedural guidance distinguishing TIAs from all other assistance agreements. Specifically, intellectual property rights, cost sharing requirements, competition requirements, and accounting standards to be followed would be addressed by the regulation. The researcher believes that providing this clear,

permanent guidance would reduce confusion about TIAs. Agreement Officers would have something they could use to get a complete understanding of TIAs as well as specific guidance on how to structure and award them. The researcher believes that this would help increase TIA usage, which would help increase DoD's access to commercial technology, which would help increase DoD's technological sophistication.

#2. Develop additional programs that foster the use of TIAs.

If more programs, like the DU S&T Program, encouraged the use of TIAs, they would be used more and would eventually become a standard way of doing business. DoD would be able to take full advantage of the commercial market's economies of scale, thereby reducing life-cycle costs for buying, operating, and maintaining weapons systems. The key to success for a TIA is to identify where the military departments and the commercial firms have mutual interests and can work together to develop technologies that meet both defense and commercial needs.

D. ANSWERS TO RESEARCH QUESTIONS

This section provides brief answers to the primary and secondary research questions posed in Chapter I.

1. Has the introduction of TIAs attracted for-profit commercial firms into the defense market?

TIAs have attracted commercial firms into the defense market. In the 1999 DoD Inspector General audit, an average of 26.1 percent of the TIA participants were new contractors that had not done cost-based research and development with DoD before. The researcher's analysis of firms participating in the DU S&T Program revealed very similar results. Of the 279 DU S&T project participants reviewed, 26.2 percent were commercial firms that had not normally done business with DoD. So clearly TIAs are reducing the barriers to commercial firms doing business in the defense market.

2. What is a TIA?

A TIA is a type of assistance agreement used for basic, applied, or advanced research projects. The Director, Defense Research and Engineering (DDR&E) established the class of instrument in December 1997. TIAs should only be used when the principle purpose of the project is stimulation or support of research, not the

acquiring of goods or services. The ultimate goal of TIAs is fostering civil-military integration in DoD Science and Technology (S&T) programs, which in turn fosters the best technologies for future defense needs.

3. How are TIAs structured?

The patent-rights provisions determine the type of instrument to be used for a TIA. If the patent-rights provisions comply with the Bayh-Dole Act, the TIA is a type of cooperative agreement. If the patent-rights are less restrictive than the Bayh-Dole Act, the TIA becomes a type of assistance transaction other than a grant or cooperative agreement. A sample TIA is provided in Appendix A.

4. Who are the primary users of TIAs?

The primary users of TIAs are the Defense Advanced Research Projects Agency (DARPA), the military departments, and traditional defense contractors. The primary organizations within the military departments that use TIAs are the Office of Naval Research (ONR), the Army Research Laboratory (ARL), and the Air Force Research Laboratory (AFRL). Commercial firms and educational establishments are also involved in TIAs. Their usage is increasing as the use of consortia increases.

5. What are the benefits and drawback of using TIAs?

The benefits of TIAs include the reduction of barriers to commercial firm participation in defense research, providing greater flexibility in negotiating terms and conditions, having industry share in the cost of R&D, and fostering civil-military integration, which enables access to commercial technology advancements.

The researcher does not believe TIAs themselves have any drawbacks. The only drawback is unfamiliarity with the TIA concept on both the part of the military and industry. As the TIA process becomes more familiar with both industry and the military, willingness to participate in the process will become more commonplace and the benefits of their use should increase.

E. SUGGESTED AREAS FOR FURTHER RESEARCH

This thesis just scratched the surface regarding TIAs. Some suggested areas for further research are below.

#1. Examine commercial industry's opinion of TIAs.

A survey could be sent to a random sampling of commercial firms that have participated in TIAs to solicit their opinion on the entire TIA process. The likes and dislikes of the process could be determined and recommendations for improvement could be made.

#2. Compare and contrast successful and unsuccessful TIAs.

A sample of successful TIAs could be examined to determine if there were consistent key factors that led to the success of the TIAs. Then a sample of unsuccessful TIAs could be examined to see if there were consistent factors that led to their failure. Recommendations to achieve success and avoid failure when awarding a TIA could be provided.

#3. Analyze TIA costs.

The 1999 DoD Inspector General audit found some discrepancies regarding TIA cost reporting. The cost reporting structure could be analyzed for strengths and weaknesses and recommendations for improvement could be provided.

#4. Analyze why TIA usage has decreased.

Even though TIAs have experienced success, their usage has been on a decline since 1998. A survey could be done with the primary military and non-military users asking for specifics on why their usage of TIAs has declined.

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**APPENDIX A. SAMPLE TECHNOLOGY INVESTMENT AGREEMENT
[REF. 17]**

TECHNOLOGY INVESTMENT AGREEMENT

BETWEEN

(INSERT CONSORTIUM NAME AND ADDRESS)

AND

THE DEFENSE ADVANCED RESEARCH PROJECTS AGENCY
3701 NORTH FAIRFAX DRIVE
ARLINGTON, VA 22203-1714

CONCERNING

(INSERT RESEARCH AND DEVELOPMENT EFFORT)

Agreement No.: MDA972-0*-3-00**

ARPA Order No.:

Total Amount of the Agreement: \$(INCLUDES CONSORTIUM AND GOVERNMENT FUNDING)

Total Estimated Government Funding of the Agreement: \$

Funds Obligated: \$

Authority: 10 U.S.C. § 2371

Line of Appropriation:

AA

\$

This Agreement is entered into between the United States of America, hereinafter called the Government, represented by The Defense Advanced Research Projects Agency (DARPA), and the (INSERT CONSORTIUM NAME) pursuant to and under U.S. Federal law.

FOR (INSERT CONSORTIUM NAME)

FOR THE UNITED STATES OF AMERICA
THE DEFENSE ADVANCED RESEARCH

(Signature)

(Signature)

(Name, Title)

(Date)

(Name, Title)

(Date)

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ATTACHMENTS

ATTACHMENT 1	Statement of Work
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ARTICLE I: SCOPE OF THE AGREEMENT**A. Background**

1. (THIS PARAGRAPH(S) DESCRIBES THE VISION OF THE PROGRAM AND SHOULD ANSWER THE FOLLOWING QUESTIONS: WHAT IS THE AGREEMENT ALL ABOUT? WHAT IS THE CURRENT TECHNOLOGICAL SITUATION? WHAT MAKES THIS PROGRAM A “CRITICAL TECHNOLOGY” EFFORT? WHY IS THE CURRENT TECHNOLOGY NOT SUFFICIENT? WHY IS IT NECESSARY FOR THE GOVERNMENT TO SUPPORT INDUSTRY IN ADDRESSING THIS SITUATION? WHAT ARE THE ISSUES OF PARTICULAR IMPORTANCE TO THE ISSUING AGENCY? WHAT ARE THE DUAL-USE (MILITARY AND COMMERCIAL) APPLICATIONS? WHAT IS THE MARKET POTENTIAL? WHAT ARE THE COMMERCIALIZATION GOALS? IF THE PROGRAM IS SUCCESSFUL, THEN WHAT? WHERE DO WE GO FROM HERE? IF THIS COLLABORATION IS SUCCESSFUL, WHAT WILL WE HAVE ACCOMPLISHED?)

B. Definitions

1. (DEFINITIONS FOR SUCH TERMS AS “CONSORTIUM”, “PARTIES”, “PROGRAM”, “CONSORTIUM MEMBERS”, ETC. SHALL BE PROVIDED HERE.)

C. Scope

1. The Consortium shall perform a coordinated research and development program (Program) designed to develop (INSERT RESEARCH AND DEVELOPMENT EFFORT). The research shall be carried out in accordance with the Statement of Work incorporated in this Agreement as Attachment 1. The Consortium shall submit or otherwise provide all documentation required by Attachment 2, Report Requirements.

2. The Consortium shall be paid for each Payable Milestone accomplished in accordance with the Schedule of Payments and Payable Milestones set forth in Attachment 3 and the procedures of Article V. Both the Schedule of Payments and the Funding Schedule set forth in Attachments 3 and 4 respectively may be revised or updated in accordance with Article III.

3. The Government and the Consortium (Parties) estimate that the Statement of Work of this Agreement can only be accomplished with the Consortium aggregate resource contribution of \$ (INSERT DOLLAR AMOUNT) from the effective date of this Agreement through (INSERT NUMBER OF MONTHS) () months thereafter. The Consortium intends and, by entering into this Agreement, undertakes to cause to be provided these funds. Consortium contributions will be provided as detailed in the Funding Schedule set forth in Attachment 4. If either DARPA or the Consortium is unable to provide its respective total contribution, the other party may reduce its project funding by a proportional amount.

D. Goals/Objectives

1. The goal of this Agreement is (INSERT GOAL(S) OF AGREEMENT).

2. The Government will have continuous involvement with the Consortium. The Government will also obtain access to research results and certain rights in data and patents pursuant to Articles VII and VIII. DARPA and the Consortium are bound to each other by a duty of good faith and best research effort in achieving the goals of the Consortium. This Agreement reflects the collaborative

document identified as “Articles of Collaboration for (INSERT NAME OF CONSORTIUM),” which document binds Consortium Members.

3. This Agreement is an “other transaction” pursuant to 10 U.S.C. § 2371. The Parties agree that the principal purpose of this Agreement is for the Government to support and stimulate the Consortium to provide its best efforts in advanced research and technology development and not for the acquisition of property or services for the direct benefit or use of the Government. This Agreement is not intended to be, nor shall it be construed as, by implication or otherwise, a partnership, a corporation, or other business organization.

ARTICLE II: TERM

A. Term of this Agreement

The Program commences upon the date of the last signature hereon and continues for (INSERT NUMBER OF MONTHS) () months. If all funds are expended prior to the (INSERT NUMBER OF MONTHS) ()-month duration, the Parties have no obligation to continue performance and may elect to cease development at that point. Provisions of this Agreement, which, by their express terms or by necessary implication, apply for periods of time other than specified herein, shall be given effect, notwithstanding this Article.

B. Termination Provisions

Subject to a reasonable determination that the program will not produce beneficial results commensurate with the expenditure of resources, either Party may terminate this Agreement by written notice to the other Party, provided that such written notice is preceded by consultation between the Parties. In the event of a termination of the Agreement, it is agreed that disposition of Data developed under this Agreement, shall be in accordance with the provisions set forth in Article VIII, Data Rights. The Government, acting through the Agreements Officer, and the Consortium, acting through its Consortium Management Committee, will negotiate in good faith a reasonable and timely adjustment of all outstanding issues between the Parties as a result of termination. Failure of the Parties to agree to a reasonable adjustment will be resolved pursuant to Article VI, Disputes. The Government has no obligation to pay the Consortium beyond the last completed and paid milestone if the Consortium, acting through its Consortium Management Committee, decides to terminate.

C. Extending the Term

The Parties may extend by mutual written agreement the term of this Agreement if funding availability and research opportunities reasonably warrant. Any extension shall be formalized through modification of the Agreement by the Agreements Officer and the Consortium Administrator.

ARTICLE III: MANAGEMENT OF THE PROJECT

A. Consortium Members

Consortium Members, as set forth in the Articles of Collaboration of the Consortium, are:

(LIST CONSORTIUM MEMBERS)

B. Consortium Management Committee (CMC)

1. The CMC shall be comprised of one voting representative from each Consortium Member, and in accordance with the Consortium Articles of Collaboration, bind the Consortium Members. The following CMC decisions are subject to DARPA approval:

(a) Changes to the Articles of Collaboration if such changes substantially alter the relationship of the Parties as originally agreed upon when the Agreement was executed;

(b) Changes to, or elimination of, any DARPA funding allocation to any Consortium Member as technically and/or financially justified;

(c) Technical and/or funding revisions to the Agreement; and

(d) Admission of additional or replacement Consortium Members.

2. The CMC is responsible for establishing a schedule of regular technical meetings to be held on a quarterly basis. The CMC shall notify all Consortium Members and the DARPA Agreements Officer's Representative of the established meeting schedule and, in the event of changes to this schedule, shall notify all Consortium Members and the DARPA Agreements Officer's Representative thirty (30) calendar days prior to the next scheduled meeting.

3. A quorum is required of the Program Managers (or designees) representing the Consortium Members and the DARPA Agreements Officer's Representative (or designee) at quarterly technical meetings. All technical decisions shall be made by (MAJORITY/CONSENSUS/ETC.) vote of the CMC and the DARPA Agreements Officer's Representative.

C. Management and Program Structure

Technical and program management of the coordinated research program established under this Agreement shall be accomplished through the management structures and processes detailed in this Article.

1. The CMC shall be responsible for the overall management of the Consortium including technical, programmatic, reporting, financial and administrative matters.

2. The DARPA Agreements Officer's Representative shall fully participate in all meetings of the CMC. Other Government personnel as deemed appropriate by the DARPA Agreements Officer's Representative may also participate in the technical portion of these meetings.

D. Program Management Planning Process

The program management and planning process shall be subject to quarterly and annual reviews with inputs and review from the CMC and the DARPA Agreements Officer's Representative.

1. Initial Program Plan: The Consortium will follow the initial program plan that is contained in the Statement of Work (Attachment 1), and the Schedule of Payments and Payable Milestones (Attachment 3).

2. Overall Program Plan Annual Review

(a) The CMC, with DARPA Agreements Officer's Representative participation and review, will prepare an overall Annual Program Plan in the first quarter of each Agreement year. (For this purpose, each consecutive twelve (12) month period from (and including) the month of execution of this Agreement during which this Agreement shall remain in effect shall be considered an "Agreement Year.") The Annual Program Plan will be presented and reviewed at an annual site review concurrent with the appropriate quarterly meeting of the CMC which will be attended by the Consortium Members, the DARPA Agreements Officer's Representative, Senior DARPA management or other DARPA program managers and personnel as appropriate. The CMC, with DARPA participation and review, will prepare a final Annual Program Plan.

(b) The Annual Program Plan provides a detailed schedule of research activities, commits the Consortium to use its best efforts to meet specific performance objectives, includes forecasted expenditures and describes the Payable Milestones. The Annual Program Plan will consolidate all prior adjustments in the research schedule, including revisions/modifications to payable milestones. Recommendations for changes, revisions or modifications to the Agreement which result from the Annual Review shall be made in accordance with the provisions of Article III, Section E.

E. Modifications

1. As a result of quarterly meetings, annual reviews, or at any time during the term of the Agreement, research progress or results may indicate that a change in the Statement of Work and/or the Payable Milestones, would be beneficial to program objectives. Recommendations for modifications, including justifications to support any changes to the Statement of Work and/or the Payable Milestones, will be documented in a letter and submitted by the CMC to the DARPA Agreements Officer's Representative with a copy to the DARPA Agreements Officer. This documentation letter will detail the technical, chronological, and financial impact of the proposed modification to the research program. The CMC shall approve any Agreement modification. The Government is not obligated to pay for additional or revised Payable Milestones until the Payable Milestones Schedule (Attachment 3) is formally revised by the DARPA Agreements Officer and made part of this Agreement.

2. The DARPA Agreements Officer's Representative shall be responsible for the review and verification of any recommendations to revise or otherwise modify the Agreement Statement of Work, Schedule of Payments or Payable Milestones, or other proposed changes to the terms and conditions of this Agreement.

3. For minor or administrative Agreement modifications (e.g. changes in the paying office or appropriation data, changes to Government or Consortium personnel identified in the Agreement, etc.) no signature is required by the Consortium.

ARTICLE IV: AGREEMENT ADMINISTRATION

Unless otherwise provided in this Agreement, approvals permitted or required to be made by DARPA may be made only by the DARPA Agreements Officer. Administrative and contractual matters under this Agreement shall be referred to the following representatives of the parties:

DARPA: (INSERT NAME) (Agreements Officer) (INSERT TELEPHONE NUMBER)

CONSORTIUM: (INSERT NAME) (Consortium Administrator) (INSERT TELEPHONE NUMBER)

Technical matters under this Agreement shall be referred to the following representatives:

DARPA: (INSERT NAME) (Agreements Officer’s Representative) (INSERT TELEPHONE NUMBER)

CONSORTIUM: (INSERT NAME) (INSERT TITLE) (INSERT TELEPHONE NUMBER)

Each party may change its representatives named in this Article by written notification to the other party.

ARTICLE V: OBLIGATION AND PAYMENT

A. Obligation

1. The Government’s liability to make payments to the Consortium is limited to only those funds obligated under this Agreement or by modification to the Agreement. DARPA may incrementally fund this Agreement.

2. If modification becomes necessary in performance of this Agreement, pursuant to Article III, paragraph E, the DARPA Agreements Officer and Consortium Administrator shall execute a revised Schedule of Payable Milestones consistent with the then current Program Plan.

B. Payments

1. In addition to any other financial reports provided or required, the CMC shall notify the DARPA Agreements Officer immediately if any contribution from a Consortium Member is not made as required.

2. Prior to the submission of invoices to DARPA by the Consortium Administrator, the Consortium shall have and maintain an established accounting system which complies with Generally Accepted Accounting Principles, and with the requirements of this Agreement, and shall ensure that appropriate arrangements have been made for receiving, distributing and accounting for Federal funds. The Parties recognize that as a conduit, the Consortium does not incur nor does it allocate any indirect costs of its own to the Consortium Member cost directly incurred pursuant to this Agreement. Consistent

with this, an acceptable accounting system will be one in which all cash receipts and disbursements are controlled and documented properly.

3. The CMC shall document the accomplishments of each Payable Milestone by submitting or otherwise providing the Payable Milestones Report required by Attachment 2, Part D. The Consortium shall submit an original and one (1) copy of all invoices to the Agreements Officer for payment approval. After written verification of the accomplishment of the Payable Milestone by the DARPA Agreements Officer's Representative, and approval by the Agreements Officer, the invoices will be forwarded to the payment office within fifteen (15) calendar days of receipt of the invoices at DARPA. Payment approval for the final Payable Milestone will be made after reconciliation of DARPA funding with actual Consortium contributions. Payments will be made by DFAS-IN, Defense Agency Financial Services, Attn: DFAS-IN/AKB (Vendor Pay), 8899 East 56th Street, Indianapolis, IN 46249-1325 within fifteen (15) calendar days of DARPA's transmittal. Subject to change only through written Agreement modification, payment shall be made to the address of the Consortium Administrator set forth below.

4. Address of Payee: (INSERT NAME AND ADDRESS OF PAYEE)

5. Government funds shall be maintained in an interest-bearing account prior to disbursement to Consortium Members. This account shall not be in U. S. Treasury Notes. Any interest earned shall be remitted annually to the DARPA Agreements Officer, or designee. Interest payments shall be made payable to the U. S. Treasury. Interest amounts less than \$250 per year may be retained by the Consortium for administrative expenses.

6. Payments shall be made in the amounts set forth in Attachment No. 3, provided the DARPA Agreements Officer's Representative has verified the accomplishment of the Payable Milestones. It is recognized that the quarterly accounting of current expenditures reported in the "Quarterly Business Status Report" submitted in accordance with Attachment No. 2 is not necessarily intended or required to match the Payable Milestones until submission of the Final Report; however, payable milestones shall be revised during the course of the program to reflect current and revised projected expenditures.

7. Limitation of Funds: In no case shall the Government's financial liability exceed the amount obligated under this Agreement.

8. Financial Records and Reports: The Consortium and Consortium Members shall maintain adequate records to account for all funding under this Agreement and shall maintain adequate records to account for Consortium Member funding provided under this Agreement. Upon completion or termination of this Agreement, whichever occurs earlier, the Consortium Administrator shall furnish to the Agreements Officer a copy of the Final Report required by Attachment 2, Part E. The Consortium's and Consortium Members' relevant financial records are subject to examination or audit on behalf of DARPA by the Government for a period not to exceed three (3) years after expiration of the term of this Agreement. The Agreements Officer or designee shall have direct access to sufficient records and information of the Consortium and Consortium Members, to ensure full accountability for all funding under this Agreement. Such audit, examination, or access shall be performed during business hours on business days upon prior written notice and shall be subject to the security requirements of the audited party.

ARTICLE VI: DISPUTES**A. General**

Parties shall communicate with one another in good faith and in a timely and cooperative manner when raising issues under this Article.

B. Dispute Resolution Procedures

1. Any disagreement, claim or dispute between DARPA and the Consortium concerning questions of fact or law arising from or in connection with this Agreement, and, whether or not involving an alleged breach of this Agreement, may be raised only under this Article.

2. Whenever disputes, disagreements, or misunderstandings arise, the Parties shall attempt to resolve the issue(s) involved by discussion and mutual agreement as soon as practicable. In no event shall a dispute, disagreement or misunderstanding which arose more than three (3) months prior to the notification made under subparagraph B.3 of this article constitute the basis for relief under this article unless the Director of DARPA in the interests of justice waives this requirement.

3. Failing resolution by mutual agreement, the aggrieved Party shall document the dispute, disagreement, or misunderstanding by notifying the other Party (through the DARPA Agreements Officer or Consortium Administrator, as the case may be) in writing of the relevant facts, identify unresolved issues, and specify the clarification or remedy sought. Within five (5) working days after providing notice to the other Party, the aggrieved Party may, in writing, request a joint decision by the DARPA Senior Procurement Executive and senior executive (no lower than (INSERT A LEVEL OF EXECUTIVE FAR ENOUGH REMOVED FROM THE PROGRAM TO MAINTAIN A GREATER LEVEL OF IMPARTIALITY) level) appointed by the CMC of the Consortium. The other Party shall submit a written position on the matter(s) in dispute within thirty (30) calendar days after being notified that a decision has been requested. The DARPA Senior Procurement Executive and the senior executive shall conduct a review of the matter(s) in dispute and render a decision in writing within thirty (30) calendar days of receipt of such written position. Any such joint decision is final and binding.

4. In the absence of a joint decision, upon written request to the Director of DARPA, made within thirty (30) calendar days of the expiration of the time for a decision under subparagraph B.3 above, the dispute shall be further reviewed. The Director of DARPA may elect to conduct this review personally or through a designee or jointly with a senior executive (no lower than (INSERT A LEVEL OF EXECUTIVE FAR ENOUGH REMOVED FROM THE PROGRAM TO MAINTAIN A GREATER LEVEL OF IMPARTIALITY) level) appointed by the CMC of the Consortium. Following the review, the Director of DARPA or designee will resolve the issue(s) and notify the Parties in writing. Such resolution is not subject to further administrative review and, to the extent permitted by law, shall be final and binding.

C. Limitation of Damages

Claims for damages of any nature whatsoever pursued under this Agreement shall be limited to direct damages only up to the aggregate amount of DARPA funding disbursed as of the time the dispute arises. In no event shall DARPA be liable for claims for consequential, punitive, special and incidental damages, claims for lost profits, or other indirect damages.

ARTICLE VII: PATENT RIGHTS

A. Definitions

1. "Invention" means any invention or discovery which is or may be patentable or otherwise protectable under Title 35 of the United States Code.
2. "Made" when used in relation to any invention means the conception or first actual reduction to practice of such invention.
3. "Practical application" means to manufacture, in the case of a composition of product; to practice, in the case of a process or method, or to operate, in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is capable of being utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.
4. "Subject invention" means any invention of a Consortium Member conceived or first actually reduced to practice in the performance of work under this Agreement.

B. Allocation of Principal Rights

Unless the Consortium shall have notified DARPA (in accordance with subparagraph C.2 below) that the Consortium does not intend to retain title, the Consortium shall retain the entire right, title, and interest throughout the world to each subject invention consistent with the provisions of the Articles of Collaboration, this Article, and 35 U.S.C. § 202. With respect to any subject invention in which the Consortium retains title, DARPA shall have a non-exclusive, nontransferable, irrevocable, paid-up license to practice or have practiced on behalf of the United States the subject invention throughout the world. Notwithstanding the above, the Consortium may elect as defined in its Articles of Collaboration to provide full or partial rights that it has retained to Consortium Members or other parties.

C. Invention Disclosure, Election of Title, and Filing of Patent Application

1. The Consortium shall disclose each subject invention to DARPA within four (4) months after the inventor discloses it in writing to his company personnel responsible for patent matters. The disclosure to DARPA shall be in the form of a written report and shall identify the Agreement under which the invention was made and the identity of the inventor(s). It shall be sufficiently complete in technical detail to convey a clear understanding to the extent known at the time of the disclosure, of the nature, purpose, operation, and the physical, chemical, biological, or electrical characteristics of the invention. The disclosure shall also identify any publication, sale, or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. The Consortium shall also submit to DARPA an annual listing of subject inventions.
2. If the Consortium determines that it does not intend to retain title to any such invention, the Consortium shall notify DARPA, in writing, within eight (8) months of disclosure to DARPA. However, in any case where publication, sale, or public use has initiated the one (1)-year statutory period wherein valid patent protection can still be obtained in the United States, the period for such notice may be shortened by DARPA to a date that is no more than sixty (60) calendar days prior to the end of the statutory period.

3. The Consortium shall file its initial patent application on a subject invention to which it elects to retain title within one (1) year after election of title or, if earlier, prior to the end of the statutory period wherein valid patent protection can be obtained in the United States after a publication, or sale, or public use. The Consortium may elect to file patent applications in additional countries (including the European Patent Office and the Patent Cooperation Treaty) within either ten (10) months of the corresponding initial patent application or six (6) months from the date permission is granted by the Commissioner of Patents and Trademarks to file foreign patent applications, where such filing has been prohibited by a Secrecy Order.

4. Requests for extension of the time for disclosure election, and filing under Article VII, paragraph C, may, at the discretion of DARPA, and after considering the position of the Consortium, be granted.

D. Conditions When the Government May Obtain Title

Upon DARPA's written request, the Consortium shall convey title to any subject invention to DARPA under any of the following conditions:

1. If the Consortium fails to disclose or elects not to retain title to the subject invention within the times specified in paragraph C of this Article; provided, that DARPA may only request title within sixty (60) calendar days after learning of the failure of the Consortium to disclose or elect within the specified times.

2. In those countries in which the Consortium fails to file patent applications within the times specified in paragraph C of this Article; provided, that if the Consortium has filed a patent application in a country after the times specified in paragraph C of this Article, but prior to its receipt of the written request by DARPA, the Consortium shall continue to retain title in that country; or

3. In any country in which the Consortium decides not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in reexamination or opposition proceedings on, a patent on a subject invention.

E. Minimum Rights to the Consortium and Protection of the Consortium's Right to File

1. The Consortium shall retain a non-exclusive, royalty-free license throughout the world in each subject invention to which the Government obtains title, except if the Consortium fails to disclose the invention within the times specified in paragraph C of this Article. The Consortium license extends to the domestic (including Canada) subsidiaries and affiliates, if any, of the Consortium Members within the corporate structure of which the Consortium Member is a party and includes the right to grant licenses of the same scope to the extent that the Consortium was legally obligated to do so at the time the Agreement was awarded. The license is transferable only with the approval of DARPA, except when transferred to the successor of that part of the business to which the invention pertains. DARPA approval for license transfer shall not be unreasonably withheld.

2. The Consortium domestic license may be revoked or modified by DARPA to the extent necessary to achieve expeditious practical application of the subject invention pursuant to an application for an exclusive license submitted consistent with appropriate provisions at 37 CFR Part 404. This license shall not be revoked in that field of use or the geographical areas in which the Consortium has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of

DARPA to the extent the Consortium, its licensees, or the subsidiaries or affiliates have failed to achieve practical application in that foreign country.

3. Before revocation or modification of the license, DARPA shall furnish the Consortium a written notice of its intention to revoke or modify the license, and the Consortium shall be allowed thirty (30) calendar days (or such other time as may be authorized for good cause shown) after the notice to show cause why the license should not be revoked or modified.

F. Action to Protect the Government's Interest

1. The Consortium agrees to execute or to have executed and promptly deliver to DARPA all instruments necessary to (i) establish or confirm the rights the Government has throughout the world in those subject inventions to which the Consortium elects to retain title, and (ii) convey title to DARPA when requested under paragraph D of this Article and to enable the Government to obtain patent protection throughout the world in that subject invention.

2. The Consortium agrees to require, by written agreement, that employees of the Members of the Consortium working on the Consortium, other than clerical and non-technical employees, agree to disclose promptly in writing, to personnel identified as responsible for the administration of patent matters and in a format acceptable to the Consortium, each subject invention made under this Agreement in order that the Consortium can comply with the disclosure provisions of paragraph C of this Article. The Consortium shall instruct employees, through employee agreements or other suitable educational programs, on the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to U.S. or foreign statutory bars.

3. The Consortium shall notify DARPA of any decisions not to continue the prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceedings on a patent, in any country, not less than thirty (30) calendar days before the expiration of the response period required by the relevant patent office.

4. The Consortium shall include, within the specification of any United States patent application and any patent issuing thereon covering a subject invention, the following statement: "This invention was made with Government support under Agreement No. MDA972-0*-3-00** awarded by DARPA. The Government has certain rights in the invention."

G. Lower Tier Agreements

The Consortium shall include this Article, suitably modified, to identify the Parties, in all subcontracts or lower tier agreements, regardless of tier, for experimental, development, or research work.

H. Reporting on Utilization of Subject Inventions

The Consortium agrees to submit, during the term of the Agreement, an annual report on the utilization of a subject invention or on efforts at obtaining such utilization that are being made by the Consortium or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Consortium subcontractor(s), and such other data and information as the agency may reasonably specify. The Consortium also agrees to provide additional reports as may be requested by DARPA in connection with any march-in proceedings undertaken by DARPA in accordance with paragraph J of this Article. Consistent with 35 U.S.C. §

202(c)(5), DARPA agrees it shall not disclose such information to persons outside the Government without permission of the Consortium.

I. Preference for American Industry

Notwithstanding any other provision of this clause, the Consortium agrees that it shall not grant to any person the exclusive right to use or sell any subject invention in the United States or Canada unless such person agrees that any product embodying the subject invention or produced through the use of the subject invention shall be manufactured substantially in the United States or Canada. However, in individual cases, the requirements for such an agreement may be waived by DARPA upon a showing by the Consortium that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that, under the circumstances, domestic manufacture is not commercially feasible.

J. March-in Rights

The Consortium agrees that, with respect to any subject invention in which it has retained title, DARPA has the right to require the Consortium, an assignee, or exclusive licensee of a subject invention to grant a non-exclusive license to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and if the Consortium, assignee, or exclusive licensee refuses such a request, DARPA has the right to grant such a license itself if DARPA determines that:

1. Such action is necessary because the Consortium or assignee has not taken effective steps, consistent with the intent of this Agreement, to achieve practical application of the subject invention;
2. Such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the Consortium, assignee, or their licensees;
3. Such action is necessary to meet requirements for public use and such requirements are not reasonably satisfied by the Consortium, assignee, or licensees; or
4. Such action is necessary because the agreement required by paragraph (I) of this Article has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such Agreement.

ARTICLE VIII: DATA RIGHTS

A. Definitions

1. "Government Purpose Rights", as used in this article, means rights to use, duplicate, or disclose Data, in whole or in part and in any manner, for Government purposes only, and to have or permit others to do so for Government purposes only.
2. "Unlimited Rights", as used in this article, means rights to use, duplicate, release, or disclose, Data in whole or in part, in any manner and for any purposes whatsoever, and to have or permit others to do so.

3. “Data”, as used in this article, means recorded information, regardless of form or method of recording, which includes but is not limited to, technical data, software, trade secrets, and mask works. The term does not include financial, administrative, cost, pricing or management information and does not include subject inventions included under Article VII.

B. Allocation of Principal Rights

1. This Agreement shall be performed with mixed Government and Consortium funding. The Parties agree that in consideration for Government funding, the Consortium intends to reduce to practical application items, components and processes developed under this Agreement.

2. The Consortium agrees to retain and maintain in good condition until (INSERT NUMBER OF YEAR) () years after completion or termination of this Agreement, all Data necessary to achieve practical application. In the event of exercise of the Government’s March-in Rights as set forth under Article VII or subparagraph B.3 of this article, the Consortium, acting through its Consortium Management Committee, agrees, upon written request from the Government, to deliver at no additional cost to the Government, all Data necessary to achieve practical application within sixty (60) calendar days from the date of the written request. The Government shall retain Unlimited Rights, as defined in paragraph A above, to this delivered Data.

3. The Consortium agrees that, with respect to Data necessary to achieve practical application, DARPA has the right to require the Consortium to deliver all such Data to DARPA in accordance with its reasonable directions if DARPA determines that:

- (a) Such action is necessary because the Consortium or assignee has not taken effective steps, consistent with the intent of this Agreement, to achieve practical application of the technology developed during the performance of this Agreement;
- (b) Such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the Consortium, assignee, or their licensees; or
- (c) Such action is necessary to meet requirements for public use and such requirements are not reasonably satisfied by the Consortium, assignee, or licensees.

4. With respect to Data delivered pursuant to Attachment 2 (and listed below), the Government shall receive Government Purpose Rights, as defined in paragraph A above. With respect to all Data delivered, in the event of the Government’s exercise of its right under subparagraph B.2 of this article, the Government shall receive Unlimited Rights.

C. Marking of Data

Pursuant to paragraph B above, any Data delivered under this Agreement shall be marked with the following legend:

Use, duplication, or disclosure is subject to the restrictions as stated in Agreement MDA972-0*-3-00** between the Government and the Consortium.

D. Lower Tier Agreements

The Consortium shall include this Article, suitably modified to identify the Parties, in all subcontracts or lower tier agreements, regardless of tier, for experimental, developmental, or research work.

ARTICLE IX: FOREIGN ACCESS TO TECHNOLOGY

This Article shall remain in effect during the term of the Agreement and for (INSERT NUMBER OF YEARS) () years thereafter.

A. Definition

1. “Foreign Firm or Institution” means a firm or institution organized or existing under the laws of a country other than the United States, its territories, or possessions. The term includes, for purposes of this Agreement, any agency or instrumentality of a foreign government; and firms, institutions or business organizations which are owned or substantially controlled by foreign governments, firms, institutions, or individuals.

2. “Know-How” means all information including, but not limited to discoveries, formulas, materials, inventions, processes, ideas, approaches, concepts, techniques, methods, software, programs, documentation, procedures, firmware, hardware, technical data, specifications, devices, apparatus and machines.

3. “Technology” means discoveries, innovations, Know-How and inventions, whether patentable or not, including computer software, recognized under U.S. law as intellectual creations to which rights of ownership accrue, including, but not limited to, patents, trade secrets, maskworks, and copyrights developed under this Agreement.

B. General

The Parties agree that research findings and technology developments arising under this Agreement may constitute a significant enhancement to the national defense, and to the economic vitality of the United States. Accordingly, access to important technology developments under this Agreement by Foreign Firms or Institutions must be carefully controlled. The controls contemplated in this Article are in addition to, and are not intended to change or supersede, the provisions of the International Traffic in Arms Regulation (22 CFR pt. 121 et seq.), the DoD Industrial Security Regulation (DoD 5220.22-R) and the Department of Commerce Export Regulation (15 CFR pt. 770 et seq.)

C. Restrictions on Sale or Transfer of Technology to Foreign Firms or Institutions

1. In order to promote the national security interests of the United States and to effectuate the policies that underlie the regulations cited above, the procedures stated in subparagraphs C.2, C.3, and C.4 below shall apply to any transfer of Technology. For purposes of this paragraph, a transfer includes a sale of the company, and sales or licensing of Technology. Transfers do not include:

- (a) sales of products or components, or

- (b) licenses of software or documentation related to sales of products or components, or
- (c) transfer to foreign subsidiaries of the Consortium Members for purposes related to this Agreement, or
- (d) transfer which provides access to Technology to a Foreign Firm or Institution which is an approved source of supply or source for the conduct of research under this Agreement provided that such transfer shall be limited to that necessary to allow the firm or institution to perform its approved role under this Agreement.

2. The Consortium shall provide timely notice to DARPA of any proposed transfers from the Consortium of Technology developed under this Agreement to Foreign Firms or Institutions. If DARPA determines that the transfer may have adverse consequences to the national security interests of the United States, the Consortium, its vendors, and DARPA shall jointly endeavor to find alternatives to the proposed transfer which obviate or mitigate potential adverse consequences of the transfer but which provide substantially equivalent benefits to the Consortium.

3. In any event, the Consortium shall provide written notice to the DARPA Agreements Officer's Representative and Agreements Officer of any proposed transfer to a foreign firm or institution at least sixty (60) calendar days prior to the proposed date of transfer. Such notice shall cite this Article and shall state specifically what is to be transferred and the general terms of the transfer. Within thirty (30) calendar days of receipt of the Consortium's written notification, the DARPA Agreements Officer shall advise the Consortium whether it consents to the proposed transfer. In cases where DARPA does not concur or sixty (60) calendar days after receipt and DARPA provides no decision, the Consortium may utilize the procedures under Article VI, Disputes. No transfer shall take place until a decision is rendered.

4. In the event a transfer of Technology to Foreign Firms or Institutions which is NOT approved by DARPA takes place, the Consortium shall (a) refund to DARPA funds paid for the development of the Technology and (b) the Government shall have a non-exclusive, nontransferable, irrevocable, paid-up license to practice or have practiced on behalf of the United States the Technology throughout the world for Government an any and all other purposes, particularly to effectuate the intent of this Agreement. Upon request of the Government, the Consortium shall provide written confirmation of such licenses.

D. Lower Tier Agreements

The Consortium shall include this Article, suitably modified, to identify the Parties, in all subcontracts or lower tier agreements, regardless of tier, for experimental, developmental, or research work.

ARTICLE X: TITLE AND DISPOSITION OF PROPERTY

A. Definitions

In this article "property" means any tangible personal property other than property actually consumed during the execution of work under this agreement.

B. Title to Property

No significant items of property are expected to be acquired under this Agreement. Title to each item of property acquired under this Agreement with an acquisition value of \$5,000 or less shall vest in the Consortium upon acquisition with no further obligation of the Parties unless otherwise determined by the Agreements Officer. Should any item of property with an acquisition value greater than \$5,000 be required, the Consortium shall obtain prior written approval of the Agreements Officer. Title to this property shall also vest in the Consortium upon acquisition. The Consortium shall be responsible for the maintenance, repair, protection, and preservation of all property at its own expense.

C. Disposition of Property

At the completion of the term of this Agreement, items of property with an acquisition value greater than \$50,000 shall be disposed of in the following manner:

1. Purchased by the Consortium at an agreed-upon price, the price to represent fair market value, with the proceeds of the sale being returned to DARPA; or
2. Transferred to a Government research facility with title and ownership being transferred to the Government; or
3. Donated to a mutually agreed University or technical learning center for research purposes; or
4. Any other DARPA-approved disposition procedure.

OR

ARTICLE X: TITLE AND DISPOSITION OF PROPERTY

A. Definitions

In this article “property” means any tangible personal property other than property actually consumed during the execution of work under this agreement.

B. Title to Property

The Consortium will acquire property with an acquisition value greater than \$5,000 under this Agreement as set forth in Attachment * to this Agreement which is necessary to further the research and development goals of this Program and is not for the direct benefit of the Government. Title to this property shall vest in the Consortium upon acquisition. Title to any other items of property acquired under this Agreement with an acquisition value of \$5,000 or less shall vest in the Consortium upon acquisition with no further obligation of the Parties unless otherwise determined by the Agreements Officer. Should any other item of property with an acquisition value greater than \$5,000 be required, the Consortium shall obtain prior written approval of the Agreements Officer. Title to this property shall also vest in the Consortium upon acquisition. The Consortium shall be responsible for the maintenance, repair, protection, and preservation of all property at its own expense.

C. Disposition of Property

At the completion of the term of this Agreement, items of property set forth in Attachment * or any other items of property with an acquisition value greater than \$5,000 shall be disposed of in the following manner:

1. Purchased by the Consortium at an agreed-upon price, the price to represent fair market value, with the proceeds of the sale being returned to DARPA; or
2. Transferred to a Government research facility with title and ownership being transferred to the Government; or
3. Donated to a mutually agreed University or technical learning center for research purposes; or
4. Any other DARPA-approved disposition procedure.

ARTICLE XI: CIVIL RIGHTS ACT

This Agreement is subject to the compliance requirements of Title VI of the Civil Rights Act of 1964 as amended (42 U.S.C. 2000-d) relating to nondiscrimination in Federally assisted programs. Each Consortium Member company has signed an Assurance of Compliance with the nondiscriminatory provisions of the Act. The Parties recognize that since the Consortium has no employees, that compliance is the responsibility of each Consortium Member.

ARTICLE XII: ORDER OF PRECEDENCE

In the event of any inconsistency between the terms of this Agreement and language set forth in the Consortium's Articles of Collaboration, the inconsistency shall be resolved by giving precedence in the following order: (1) The Agreement, (2) Attachments to the Agreement, (3) Consortium Articles of Collaboration.

ARTICLE XIII: EXECUTION

This Agreement constitutes the entire agreement of the Parties and supersedes all prior and contemporaneous agreements, understandings, negotiations and discussions among the Parties, whether oral or written, with respect to the subject matter hereof. This Agreement may be revised only by written consent of the CMC and DARPA Agreements Officer. This Agreement, or modifications thereto, may be executed in counterparts each of which shall be deemed as original, but all of which taken together shall constitute one and the same instrument.

STATEMENT OF WORK

(Initial Program Plan)

Task 1:

REPORT REQUIREMENTS

A. QUARTERLY REPORT

On or before ninety (90) calendar days after the effective date of the Agreement and quarterly thereafter throughout the term of the Agreement, the Consortium Management Committee (CMC) shall submit or otherwise provide a quarterly report. Two (2) copies shall be submitted or otherwise provided to the DARPA Agreements Officer's Representative, one (1) copy shall be submitted or otherwise provided to the DARPA Agreements Officer and one (1) copy shall be submitted or otherwise provided to DARPA/(INSERT PROGRAM OFFICE), Attn: Assistant Director for Program Management. The report will have two (2) major sections.

1. Technical Status Report. The technical status report will detail technical progress to date and report on all problems, technical issues or major developments during the reporting period. The technical status report will include a report on the status of consortium collaborative activities during the reporting period.

2. Business Status Report. The business status report shall provide summarized details of the resource status of this Agreement, including the status of contributions by the Consortium participants. This report will include a quarterly accounting of current expenditures as outlined in the Annual Program Plan. Any major deviations, over plus or minus 10%, shall be explained along with discussions of the adjustment actions proposed. The report will also include an accounting of any interest earned on Government funds. The Consortium is reminded that interest in amounts greater than \$250 per year is not expected to accrue under this Agreement. In the event that this interest does accrue on Government funds, the Consortium is required to provide an explanation for the accrual in the business report. Depending on the circumstances, the Payable Milestones may require adjustment.

B. ANNUAL PROGRAM PLAN DOCUMENT

The CMC shall submit or otherwise provide to the DARPA Agreements Officer's Representative one (1) copy of a report which describes the Annual Program Plan as described in Article III, Section D. This document shall be submitted not later than thirty (30) calendar days following the Annual Site Review as described in Article III, Section D.

C. SPECIAL TECHNICAL REPORTS

As agreed to by the Consortium and the DARPA Agreements Officer's Representative, the CMC shall submit or otherwise provide to the DARPA Agreements Officer's Representative one (1) copy of special reports on significant events such as significant target accomplishments by Consortium Members, significant tests, experiments, or symposia.

D. PAYABLE MILESTONES REPORTS

The CMC shall submit or otherwise provide to the DARPA Agreements Officer's Representative documentation describing the extent of accomplishment of Payable Milestones. This information shall be as required by Article V, paragraph B and shall be sufficient for the DARPA Agreements Officer's Representative to reasonably verify the accomplishment of the milestone of the event in accordance with the Statement of Work.

E. FINAL REPORT (NOTE: The Final Report is the last Payable Milestone for the completed Agreement.)

1. The CMC shall submit or otherwise provide a Final Report making full disclosure of all major developments by the Consortium upon completion of the Agreement or within sixty (60) calendar days of termination of this Agreement. With the approval of the DARPA Agreements Officer's Representative, reprints of published articles may be attached to the Final Report. Two (2) copies shall be submitted or otherwise provided to the DARPA Agreements Officer's Representative and one (1) copy shall be submitted or otherwise provided to DARPA/(INSERT PROGRAM OFFICE), Attn: Assistant Director for Program Management. One (1) copy shall be submitted to the Defense Technical Information Center, Attn: DTIC-BCS, 8725 John J. Kingman Road, Suite 0944, Fort Belvoir, VA 22060-0944.

2. The Final Report shall be marked with a distribution statement to denote the extent of its availability for distribution, release, and disclosure without additional approvals or authorizations. The Final Report shall be marked on the front page in a conspicuous place with the following marking:

"DISTRIBUTION STATEMENT B. Distribution authorized to U.S. Government agencies only to protect information not owned by the U.S. Government and protected by a contractor's "limited rights" statement, or received with the understanding that it not be routinely transmitted outside the U.S. Government. Other requests for this document shall be referred to DARPA/Technical Information Officer."

F. EXECUTIVE SUMMARY

The CMC shall submit a one to two page executive-level summary of the major accomplishments of the Agreement and the benefits of using the "other transactions" authority pursuant to 10 U.S.C. § 2371 upon completion of the Agreement. This summary shall include a discussion of the actual or planned benefits of the technologies for both the military and commercial sectors. Two (2) copies shall be submitted to the DARPA Agreements Officer.

SCHEDULE OF PAYMENTS AND PAYABLE MILESTONES

<u>TASK</u>	<u>MONTH</u>	<u>PAYABLE MILESTONES</u>	<u>DARPA PAYMENT</u>	<u>CONSORTIUM PAYMENT</u>
-------------	--------------	---------------------------	--------------------------	-------------------------------

1.

FUNDING SCHEDULE

A. PROJECTED PROGRAM FUNDING COMMITMENTS

	<u>DARPA Funding</u>	<u>Consortium Contribution</u>
FY 0*	\$	\$
FY 0*	\$	\$
FY 0*	\$	\$
TOTALS	\$ _____	\$ _____

DARPA funding shall be applied toward the following expenses: **(list types of expenses).**

B. CONSORTIUM MEMBER CONTRIBUTIONS

<u>Member</u>	<u>Contribution</u>	<u>Cash*</u>	<u>In-kind**</u>
Company A	\$	\$	\$
Company B	\$	\$	\$
Company C	\$	\$	\$
Company D	\$	\$	\$
	_____	_____	_____
TOTALS	\$	\$	\$

*Cash contributions consist of ... **(list types of contributions).**

In-kind contributions consist of ... **(list types of contributions but also include the basis for determining the in-kind value).

LIST OF GOVERNMENT AND CONSORTIUM REPRESENTATIVES

GOVERNMENT:

(NAME)
DARPA/OFFICE
3701 N. Fairfax Drive
Arlington, VA 22203-1714
phone: (703) 696-****
FAX: (703) 696-****
Email: *****@darpa.mil

(NAME)
DARPA/OFFICE
3701 N. Fairfax Drive
Arlington, VA 22203-1714
phone: (703) 696-****
FAX: (703) 696-****
Email: *****@darpa.mil

CONSORTIUM:

(NAME)
(ORGANIZATION)
(ADDRESS)
phone:
FAX:
Email:

(NAME)
(ORGANIZATION)
(ADDRESS)
phone:
FAX:
Email:

APPENDIX B. SAMPLE OF DU S&T PROJECT PARTICIPANTS

A

Allison Transmission
Advanced Technology Materials, Inc.
AeroMet
Asymetrix Learning Systems, Inc.

B

Bell Helicopter Textron
Boeing Company
BMX Technologies
Bath Iron Works Corp.
Bales Scientific, Inc.

C

Cummins Engine Company
Cornell University
Cephid Inc.
Click2Learn
CYTEC
Crown Disposal

D

Donalson Company
Detroit Diesel Corp.

E

ERG Materials and Aerospace Corp.
Electro Energy, Inc.
Electronic Data Systems Corporation
Enidine, Inc.

F

Ferrite Company
Flow International Corp.

Fiber Innovations, Inc.

G

Graphic Packaging Corporation
General Atomics
GE Aircraft Engines
Giordano Automation Corp.

H

Honeybee Robotics
Hamilton Standard
Harris Corporation
Honeywell Technology Center
Hughes Aircraft
H Power Corp.

I

ITT Industries
Intevac, Inc.
Integrated Technologies, Inc.
Interactive Solutions, Inc.
Indigo Systems Corporation
Implant Sciences Corporation

J

JWK International Corporation
Jacobs Vehicle Systems

K

Kraft Foods
Kenworth Truck Company

L

Linkabit Wireless, Inc.
Lynntech
Litton Electronic Devices Division
Lockheed Martin

M

McDermott Technology
MAK Technologies
MTS Systems Corp.
McDonnell Douglas Corp.
Mack Trucks

N

New Flyer
Northern Research & Engineering Corp.
Northrup Grumman Corp.
Nanodyne Incorporated

O

Ovonic Battery Company
Oshkosh Truck Corporation

P

Proctor and Gamble Company
Pratt and Whitney
Planar Systems, Inc.
Pennsylvania State University

Q

QorTek, Inc.

R

Rockwell Collins
Rexam Containers
Raytheon Systems Company
Reed Hannebaum Engineering Services

Rolls-Royce Allison
Rocky Research
Radian, Inc.

S

Sikorsky Aircraft Corp.
Sensor Technology Limited
Sonatech
Stanford University
Sonalysts, Inc.

T

Truitt Brothers
TRW, Inc.
Therus Corporation
TASC Parametric Technologies Corp.
TDA Research, Inc.

U

United Technologies
University of South Carolina
University of Connecticut
University of Iowa
University of Florida
United Defense

V

Virginia Polytechnic Institute

W

Washington State University
Web Converting, Inc.

Y

Yankee Scientific

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