United States General Accounting Office

GAO

Report to Congressional Requesters

[redacted]

143395

GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-242554

January 28, 1993

The Honorable Sam Nunn
Chairman
The Honorable Strom Thurmond
Ranking Minority Member
The Honorable John W. Warner
Committee on Armed Services
United States Senate

This report responds to your request for information on counterdrug technology and its development. Specifically, you asked that we review the current efforts of the Department of Defense (DOD) and the Chief Scientist, Office of National Drug Control Policy (ONDCP), to develop and demonstrate counterdrug technology applications with an emphasis on DOD's efforts to develop cargo container inspection technology. We briefed the Committee staff on the results of our work on August 14 and October 13, 1992.

Results in Brief

The National Defense Authorization Act for Fiscal Year 1991, enacted November 1990, established the Counterdrug Technology Assessment Center within ONDCP. Since his appointment in November 1991, the Chief Scientist who heads the Technology Center has been working to organize and staff it. In August 1992, ONDCP published a counterdrug research and development technology blueprint to guide DOD, the drug law enforcement agencies (LEA), and industry in their research efforts under the National Counterdrug Enforcement Research and Development Program. ONDCP's Technology Center oversees this program as executed through the individual research and development programs of DOD and LEAs. Under the blueprint, federal agencies and departments will continue to develop their own counterdrug research and development budgets; however, the Center will act as a clearinghouse for coordinating resources to support the national program. Fiscal year 1993 DOD and LEA funding for counterdrug research and development, included in this program, is estimated at $131 million.

Also, in 1990, the House Appropriations Committee directed DOD, in coordination with the U.S. Customs Service, to develop a comprehensive plan for developing prototype counterdrug technology for use in contraband detection/cargo container inspection. In April 1991, DOD's Defense Advanced Research Projects Agency published its plan, which

included about $26 million for fiscal year 1991. Twelve projects in the plan deal specifically with cargo container inspection technology. All of the Agency's counterdrug projects are included in ONDCP's blueprint.

Generally, the law enforcement community continues to depend on the adaptation of existing off-the-shelf technology to fight the drug war. The Defense Advanced Research Projects Agency is currently funding research and development for new counterdrug technology with particular emphasis on cargo container inspection technology; however, this effort is relatively new and, therefore, working prototypes are generally not yet available for field testing.

Background

The Anti-Drug Abuse Act of 1988 created ONDCP within the Executive Office of the President to establish the policies, objectives, and priorities of the National Drug Control Program and to oversee their implementation by DOD and LEAs. ONDCP also produces the President's annual National Drug Control Strategy. Since 1989, each Strategy has dealt with the need for counterdrug technology research and development.

The National Defense Authorization Act for Fiscal Year 1991 further defined ONDCP's counterdrug technology research and development role by establishing the Technology Center and designating the Chief Scientist as its head. The Chief Scientist identifies and prioritizes counterdrug technology needs within the National Counterdrug Enforcement Research and Development Program and oversees and coordinates the counterdrug technology initiatives of DOD and LEAs.

The National Defense Authorization Act first authorized research and development funding in DOD's counterdrug program in fiscal year 1990. The act instructed the Secretary of Defense to ensure that adequate DOD research and development activities, including those of the Defense Advanced Research Projects Agency, were devoted to technologies that would (1) enhance DOD's detection and monitoring role and (2) improve the ability to detect illicit drugs and other dangerous substances concealed in containers. Various congressional reports associated with the fiscal year 1991 Defense Appropriations Act directed DOD to develop a comprehensive plan for developing prototype technology for contraband detection, especially technology to facilitate cargo container inspection, a major concern of the Customs Service.

Management of the National Counterdrug Research and Development Program

On August 7, 1992, ONDCP published the Counterdrug Enforcement Research and Development Blueprint. The blueprint provides those agencies involved in counterdrug research and development with ONDCP's and the Technology Center's directions for developing the technology necessary to implement the National Counterdrug Enforcement Research and Development Program consistent with the goals and objectives of the President's National Drug Control Strategy.

Since ONDCP was established, its Science and Technology Committee and the Committee's Working Groups have been used to identify counterdrug technology requirements covering the needs of the drug law enforcement community and DOD. However, until the Technology Center was created, there was no single organization for influencing the appropriation and allocation of research and development funds to support these requirements. According to the blueprint and the Chief Scientist, in managing the National Counterdrug Enforcement Research and Development Program, the Center

- uses ONDCP's Science and Technology Committee and its working group structure as a forum for the counterdrug community to discuss and develop research and development requirements;
- reviews ongoing and proposed counterdrug research and development plans and budget requests; and
- through the ONDCP budget review process, identifies research and development efforts that may be unnecessarily redundant or duplicative.

The counterdrug blueprint calls for the Technology Center and the individual agencies to work together to select projects that support the goals of the national program. In general, the Center oversees the national counterdrug research and development program executed through the individual research and development programs of DOD and LEAs. Under the blueprint, federal agencies and departments with a counterdrug mission will continue to develop counterdrug research and development budgets; however, the Center will act as a clearinghouse for coordinating research and development resources to support the national program.

According to the Chief Scientist, the Center will augment agency programs by funding core projects in three technology areas. Core projects are Center funded short-, mid-, or long-term projects that satisfy a requirement that might not otherwise be funded. The three technology areas relate to the overall supply and demand reduction objectives of the President's

National Drug Control Strategy. The technologies related to the Strategy's supply reduction objectives are:

- The wide area surveillance effort develops prototype technology to detect and continuously monitor suspect aircraft, ships, motor vehicles, and persons transporting drugs, for example, electronic tagging devices.
- The non-intrusive inspection effort develops technology that allows rapid, automatic inspection of cargo containers and other packages without physically removing the contents, for example, pulsed fast neutron activation and high energy X-ray.
- The tactical technologies effort develops prototype equipment to support tactical operations against drug trafficking organizations, for example, covert radios and recorders.

Technology goals for the demand reduction area have not yet been defined; however, the blueprint notes that research and development investment in substance abuse and rehabilitation are a high priority for demand reduction efforts.

Counterdrug research and development funding in these areas of the national program, which includes projects funded under DOD and LEAs counterdrug research and development programs, was $114 million and $104 million in fiscal years 1991 and 1992, respectively. Estimated funding for the fiscal year 1993 program is $131 million. In fiscal year 1992, the Technology Center had a $20-million budget and funded 18 technology initiatives/core projects.

Status of Counterdrug Technology Development

According to the Chief Scientist and DOD and Customs officials, most of the counterdrug technology developed and fielded to date by the law enforcement community resulted from the adaptation of off-the-shelf technologies. However, new technology is being developed.

When compared to DOD, the counterdrug research and development budgets of LEAs are rather small—ranging from $0.3 million to $6.7 million in fiscal year 1992. As a result, LEA counterdrug efforts have generally relied on modifying commercial equipment. This practice has allowed the law enforcement community to stretch its funds and respond quickly to the operational needs of its field agents. It has not allowed them to build research and development programs to the same level of sophistication as DOD. However, LEAs have benefited from DOD's research and development investment.

DOD has helped the law enforcement community in those technology areas in which DOD has been able to easily adapt off-the-shelf technology to counterdrug applications, often those that closely parallel military applications. For example, DOD has assisted Customs in increasing its air and surface surveillance capability by supporting Customs' airborne early warning aircraft radar systems. DOD technology support, such as secure telephones and the Anti-Drug Network, has been a major factor in increasing the law enforcement community's communications capability.

DOD is developing new counterdrug technology through implementation of its Prototype Technology Development Plan for Contraband Detection/Cargo Container Inspection. New technology being developed, especially for the cargo container inspection area, involves longer term, state-of-the-art type projects. Therefore, working prototypes are generally not yet available for field testing.

DOD's Prototype Development Plan

In April 1991, the Defense Advanced Research Projects Agency, acting as DOD's agent, issued its prototype development plan. DOD counterdrug research and development funding in fiscal years 1991 and 1992 was about $61 million and $91.5 million, respectively. Estimated funding for fiscal year 1993 is $69.3 million. Some of DOD's counterdrug research and development are classified programs and, therefore, are not listed in ONDCP's counterdrug blueprint. However, about $26 million in fiscal years 1991 and 1992 and $30 million in fiscal year 1993 for DOD-sponsored projects in the Agency's plan is included under the Technology Center's program.

The Agency's plan describes how technology will be developed to meet the needs of the LEAs. Candidate proposals for prototype development were selected from solicitations received in response to the Agency's 1990 Broad Agency Announcement and from other sources. The plan was coordinated within DOD, including the Office of the DOD Coordinator for Drug Enforcement Policy and Support, and with ONDCP and the Customs Service.

The categorization of counterdrug technology areas in the Agency's plan differs somewhat in name from those that the Technology Center has proposed. However, all of them are included in the technology areas that the Center has identified. The Agency's plan identifies the technology areas as container inspection; surveillance and tracking; electronic support measures; data processing; and command, control, and

communication. Although all of the areas are important, the plan emphasizes cargo container inspection technology.

Cargo Container Inspection Technology

The law enforcement community has identified cargo containers as a major threat for the import of illegal drugs into the United States. Additionally, in directing DOD to develop a counterdrug research and development plan, the House Report on DOD's Fiscal Year 1991 Appropriations Act cites the cargo container inspection problem as the principal reason for such a plan and notes specific technologies, for example, fast neutron activation analysis and neutron elastic scatter, that should be pursued.

According to the Agency's plan, cargo container inspection technology relates mostly to those counterdrug activities that take place in the arrival area—usually the ports of entry to the United States. This technology is designed to facilitate inspection of cargo containers, personal luggage, vehicles, and bulk cargo, using neutron, X-ray, and chemical techniques. For example:

- Neutron inspection techniques use neutron beams that penetrate the container and react with concealed drugs or drug byproducts. Four neutron projects included in the plan are pulsed fast neutron activation, neutron elastic scatter, pulsed sources, and neutron pulsed sources. The Agency is developing other non-intrusive inspection technologies and has awarded research and development contracts for two X-ray systems, one using high and the other using low energy X-ray sources. Neutron and X-ray inspection systems can be used separately or in combination.
- Six separate chemical inspection techniques are being investigated under the Agency's research and development contracts. Chemical inspection techniques rely on the collection and analysis of chemical vapors or particles. These projects involve chemical vapor sampling, chemical microsensor, chemical detection scanner, radiation enhanced vapor detector, hand held chemical detector, and a fiber optic sensor.

Appendix I contains detailed information on the current cargo container inspection projects managed under the Agency's prototype development plan.

Concerns About New Technology

Law enforcement community and industry officials have concerns about the funding, impact on shipping, and safety of some of the technologies currently being developed. These concerns relate principally to the major

non-intrusive container inspection technologies, such as pulsed fast neutron activation and the high energy X-ray system.

Funding the New Systems

In relation to traditional low cost, off-the-shelf counterdrug technology, both the pulsed fast neutron activation and high energy X-ray will be expensive to field and operate. Fielding will require large investments in land, facilities, and equipment. Although exact costs are not yet available, contractor and government officials estimated that facility and equipment costs per system could be as much as $10 million. These technologies will also require special maintenance and could necessitate additional staff, some of whom may require special training. Again, exact costs are not yet known, but estimates of annual operating and maintenance costs per system range from $1 million to $1.5 million.

The ultimate cost to field and operate these systems will be a function of decisions by Customs—the eventual user. Customs will have to decide, for example, (1) whether it wants a single system in place or a combination of systems, for example, pulsed fast neutron activation and the high energy X-ray; (2) how many ports of entry should have this inspection capability; and (3) the number of systems at each port.

Government and industry officials recognize that the current Customs' budget for counterdrug technology development does not easily accommodate this type of investment. Although Customs' budget could be increased, another alternative has been discussed by government and industry officials. Contractors may be willing to field and operate these systems for Customs and recoup their investment through user fees charged to shippers.

Impact on Shippers

The current system of examining people, vehicles, cargo, and mail for illicit or contraband substances is labor intensive and slow. About 8 million containers entered the United States in fiscal year 1992, and this number is expected to increase in the future. Today, with the emphasis on drug interdiction, in addition to other contraband detection and tariff collection requirements, Customs needs a mechanism to perform inspections at a high throughput rate and increase the reliability of inspections.

Currently, when Customs suspects that a container may contain drugs/contraband, that container is sent to an inspection point and examined. Doing so may require that the container be completely emptied, holes drilled in the container walls and floors, or interior dimensions

measured. Because these procedures are labor intensive and slow, Customs tries to minimize the impact of inspections on its work force, as well as the shipping industry.

Pulsed fast neutron activation and high energy X-ray technology have the potential to significantly decrease the impact on cargo container inspections. Container cargo can be screened without performing the time consuming inspection procedures previously discussed. However, decisions by Customs will determine how these systems impact shipping. Customs must decide, for example, what percentage of the cargo containers processed through any port must be screened by these systems and what degree of accuracy it expects from the inspection process.

Safety of the New Systems

Customs officials informed us that they and some local government port authority officials have concerns about the safety of the pulsed fast neutron activation and high energy X-ray systems.

Pulsed fast neutron activation and high energy X-ray use electronically generated neutrons and X-rays, respectively, for drug detection in cargo containers. These systems must meet federal and state safety standards to be used in cargo processing, for example, residual doses of radiation in food stuffs. Also, operators and others in the area of the equipment must be convinced that their health will not be impaired by even small doses of radiation. According to Customs officials, local port authority officials are concerned that accidents or sabotage by traffickers may expose personnel to unsafe levels of radiation. System developers will be pursuing these issues with various government agencies, such as the Food and Drug Administration.

Objective, Scope, and Methodology

Our objective was to examine general developments in counterdrug technology with specific emphasis on cargo container inspection. To address this objective, we obtained and evaluated plans that were formulated to guide counterdrug technology efforts and ascertained the status of plan implementation. We determined the extent of coordination between DOD, ONDCP, and the LEAs in developing and executing these plans. Finally, we determined the status of counterdrug technology development in the cargo container inspection area.

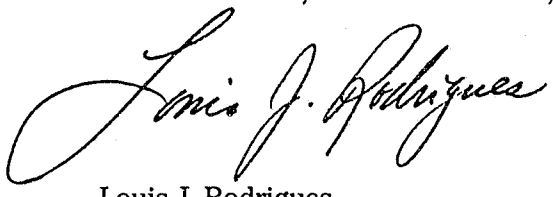
Our work was performed in the Washington, D.C., area and included the DOD Drug Coordinator's Office, Defense Advanced Research Projects Agency, ONDCP's Counterdrug Technology Assessment Center, and U.S.

Customs Service. We interviewed cognizant officials in these organizations and obtained and evaluated relevant documents, such as plans, project progress files, and meeting minutes. We also visited several Customs ports of entry to observe the use of off-the-shelf technologies and two contractors developing new technology under DOD research and development contracts. We conducted our work between March and November 1992 in accordance with generally accepted government auditing standards.

As requested, we did not obtain written comments on this report; however, we did discuss its contents with DOD, ONDCP, and Customs officials. They agreed with the report's message and provided technical corrections, which we incorporated where appropriate.

As agreed with the Committee, unless this report's contents are publicly announced earlier, we plan no further distribution of this report until 10 days after its issue date. At that time, we will send copies to the Directors of the Office of National Drug Control Policy and the Office of Management and Budget, and to the Secretaries of Defense, Treasury, and Transportation. We will also send copies to other interested parties upon request.

Please contact me at (202) 275-4841 if you or your staff have any questions concerning this report. Other major contributors to this report were Robert J. Stolba, Assistant Director, and Bruce H. Thomas, Evaluator.



Louis J. Rodrigues
Director, Command, Control, Communications,
and Intelligence Issues

Cargo Container Inspection Project Data

Project Name

Pulsed Fast Neutron Activation

Project Description

Develop and demonstrate a container inspection system that uses pulsed fast neutron activation technology to interrogate the three dimensional volume of a container and identify the presence of drugs or other contraband. The system makes possible a measurement of the distribution of elements inside the container. Drugs are detected by locating concentrations of their characteristic elements. The potential customer for this technology is U.S. Customs Service.

Table I.1: Pulsed Fast Neutron Activation Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$2,340	$5,138	$6,570	$7,500

Table I.2: Pulsed Fast Neutron Activation Project Schedule

Milestone	Target date	Date accomplished
Laboratory model fabrication and test	Nov. 92	June 92
Fabricate prototype	Aug. 94	
Prototype test and deployment	Aug. 95	

Performance Results

Initial laboratory testing demonstrated the systems' capability to detect and identify quantities of cocaine in the middle of an 8x8x40 foot cargo container.

Project Name

High Power (Energy) X-ray and Test Bed

Project Description

High energy X-ray: Demonstrate the capability of high energy X-ray systems for non-intrusive inspection of fully loaded, large cargo containers. Requires medium/high energy for penetration. Develop signal processing algorithms to maximize detection and minimize false alarms. The potential customer for this technology is U.S. Customs Service.

Test bed: Operate an existing container inspection test bed at Houston, Texas. Design, construct, and operate an advanced test bed at Tacoma, Washington. The test beds will be operated jointly with Customs. The test

beds will provide a convenient site to investigate systems integration issues and sensor signal processing and will allow user evaluation.

Table I.3: Funding for X-ray and Test Bed

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$4,683	$4,264	$7,000	$20,000

Table I.4: Project Schedule for X-ray and Test Bed

Milestone	Target date	Date accomplished
X-ray		
Complete initial X-ray testing at Houston	Oct. 92	Oct. 92
Install X-ray system at Tacoma	June 93	
Completion of X-ray testing at Tacoma	Aug. 95	
Test bed		
Complete Houston operations	Oct. 92	Oct. 92
Initiate construction at Tacoma	Aug. 92	Aug. 92
Complete Tacoma operation	Aug. 95	

Performance Results

In laboratory test performed at Houston, resolution and sensitivity have been verified using standard metal test targets; actual and simulated contraband will be tested.

Project Name

Neutron Pulsed Sources

Project Description

Develop and demonstrate a container inspection system that uses pulsed fast neutron activation technology. The technique uses neutrons from an accelerator source to induce inelastic scattered gamma rays in materials. By analysis of the resulting gamma rays, it is possible to identify the materials contained in a container. The main advantages of this system include unambiguous identification of illicit drugs, and complete analysis of containers. The potential customer for this technology is U.S. Customs Service.

Table I.5: Neutron Pulsed Sources Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$2,395	$0	$3,600	$1,660

Table I.6: Neutron Pulsed Sources Project Schedule

Milestone	Target date	Date accomplished
Conceptual design and feasibility laboratory tests	May 93	
Prototype design	Mar. 94	
Prototype fabrication	Nov. 94	
Prototype test and deployment	Mar. 95	

Performance Results

No performance testing done to date.

Project Name

Fiber Optic Chemical Sensor

Project Description

Design and demonstrate a portable chemical sensor. Uses antibody based sensor immobilized on core of fiber optic cable. Sensor/reagent fluoresces when exposed to target substance. Spectrometric assay of fluorescence determines type and amounts of drugs/processing chemicals. High risk/high payoff technology development. Potential customers for this technology are U.S. Customs Service, Drug Enforcement Administration, U.S. Coast Guard, Federal Bureau of Investigation, and Immigration and Naturalization Service.

Table I.7: Fiber Optic Chemical Sensor Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$309	$0	$0	$0

Table I.8: Fiber Optic Chemical Sensor Project Schedule

Milestone	Target date	Date accomplished
Conceptual design and feasibility test	July 94	

Performance Results

No performance testing done to date.

Project Name

Radiation Enhanced Vapor Detector

Project Description

Investigate the use of an advanced chemical vapor technique that utilizes radiation bombardment of the target, which causes emission of secondary gases. Target is identified by secondary gas. Potential customers include U.S. Customs Service, Drug Enforcement Administration, U.S. Coast Guard, Federal Bureau of Investigation, and Immigration and Naturalization Service.

Table I.9: Radiation Enhanced Vapor Detector Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$53	$93	$0	$0

Table I.10: Radiation Enhanced Vapor Detector Project Schedule

Milestone	Target date	Date accomplished
Feasibility study	June 92	June 92
Laboratory demonstration	Apr. 93	

Performance Results

No performance testing done to date.

Project Name

Chemical Sensor/Neural Net

Project Description

Design and demonstrate a miniature "smart" chemical detector suitable for hand held applications. This device will be used to detect and identify illegal drugs by means of a gas chromatograph on a microchip. Potential customers include U.S. Customs Service, Drug Enforcement Administration, U.S. Coast Guard, Federal Bureau of Investigation, and Immigration and Naturalization Service.

Table I.11: Chemical Sensor/Neural Net Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$508	$475	$600	$1,800

Table I.12: Chemical Sensor/Neural Net Project Schedule

Milestone	Target date	Date accomplished
Signature data base	Sept. 92	Sept. 92
Instrument design	Dec. 93	
Prototype fabrication	Oct. 94	
Demonstration	Apr. 95	

Performance Results

No performance testing done to date.

Project Name

Advanced X-ray

Project Description

Develop X-ray system for non-intrusive inspection of cargo containers. Investigate forward and backscatter, multiple beam, and variable energy techniques to image drug substances in large containers. Develop signal processing algorithms to maximize detection and minimize false alarms. The potential customer is U.S. Customs Service.

Table I.13: Advanced X-ray Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$1,210	$770	$750	$500

Table I.14: Advanced X-ray Project Schedule

Milestone	Target date	Date accomplished
Deliver prototype	May 93	
Install at test bed	Aug. 93	
Complete demonstration	Sept. 94	

Performance Results

No performance testing done to date.

Project Name

Chemical Microsensor

Project Description

Use emerging technology for Surface Acoustic Wave chemical microsensors and micro-instrument technology. Surface conducting properties change when exposed to target substance. Each module is being designed to detect a specific chemical or vapor class through which

illegal drugs can be identified. Potential customers for this technology include U.S. Customs Service, Drug Enforcement Administration, U.S. Coast Guard, Federal Bureau of Investigation, and Immigration and Naturalization Service.

Table I.15: Chemical Microsensor Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$406	$500	$400	$100

Table I.16: Chemical Microsensor Project Schedule

Milestone	Target date	Date accomplished
Design and test breadboard	Mar. 93	
Design prototype	Feb. 94	
Fabricate and test prototype	Feb. 95	

Performance Results

No performance testing done to date.

Project Name

Neutron Elastic Scatter

Project Description

Investigate use of neutron elastic scatter as a means for non-intrusive inspection of containers. This system will use neutron beams to penetrate containers to look for drugs. The potential advantage is its use of low energy instead of high energy sources. The U.S. Customs Service is the potential customer.

Table I.17: Neutron Elastic Scatter Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$159	$444	$600	$2,050

Table I.18: Neutron Elastic Scatter Project Schedule

Milestone	Target date	Date accomplished
Design concept study	Sept. 92	Sept. 92
Laboratory demonstration	Sept. 93	
Design and fabricate prototype	Sept. 94	

Performance Results

No performance testing done to date.

Project Name

Quick Screen Cargo Inspection

Project Description

Demonstrate quick, inexpensive prescreen of containers. Detect and identify methyl benzoate (cocaine) and acetic acid (heroin) by-products. This system will collect vapors from containers and detect illegal drug particles. Potential customers for this technology include U.S. Customs Service, Drug Enforcement Administration, U.S. Coast Guard, Federal Bureau of Investigation, and Immigration and Naturalization Service.

Table I.19: Quick Screen Cargo Inspection Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$240	$425	$0	$0

Table I.20: Quick Screen Cargo Inspection Project Schedule

Milestone	Target date	Date accomplished
Conceptual design, fabrication, and test	June 92	June 92
Prototype development and test	Jan. 94	

Performance Results

Laboratory tests quantified the minimum levels of vapors detectable by this device.

Project Name

Improved Acquisition for Ultra-Trace Chemical Samples

Project Description

Design and demonstrate improved sampler and preconcentrator for chemical detection and identification. Both solid and/or vapor sample is heated in a receiver, then concentrated for future chemical analysis. Potential customers for this technology include U.S. Customs Service, Drug Enforcement Administration, U.S. Coast Guard, and Immigration and Naturalization Service.

Table I.21: Improved Acquisition for Ultra-Trace Chemical Samples Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$284	$200	$100	$0

Table I.22: Improved Acquisition for Ultra-Trace Chemical Samples Project Schedule

Milestone	Target date	Date accomplished
Conceptual design study complete	Jan. 93	
Laboratory demonstration	Sept. 93	
Design and fabricate prototype	Sept. 94	

Performance Results

No performance testing done to date.

Project Name

Neutron Sources

Project Description

Develop a low power, continuous neutron source. Potential application for inspection of small packages and as an enhancement to pulsed fast neutron activation for detection of illegal drugs. The potential customer is U.S. Customs Service.

Table I.23: Neutron Sources Project Funding

Dollars in thousands

FY 1991 (actual)	FY 1992 (actual)	FY 1993 (estimate)	To complete (estimate)
$271	$728	$500	$0

Table I.24: Neutron Sources Project Schedule

Milestone	Target date	Date accomplished
Proof of principle	Nov. 92	Nov. 92
Prototype source fabrication and demonstration	Nov. 93	
Integrate source into system and test	Nov. 94	

Performance Results

No performance testing done to date.