A Counterdrug Research and Development Blueprint Update

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Executive Office of the President
Office of National Drug Control Policy
Counterdrug Technology Assessment Center

September 1996

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF NATIONAL DRUG CONTROL POLICY
Washington, D.C. 20503

September 10, 1996

Dear Colleague:

The Counterdrug Technology Assessment Center was established by Congress within the Office of National Drug Control Policy to serve as the central counterdrug enforcement research and development organization of the United States Government. Attached is the "Counterdrug Research and Development Blueprint Update," our fourth periodic report on the status of the national counterdrug research and development program.

This report includes the priority counterdrug research and development requirements identified by the counterdrug law enforcement agencies. The program described is consistent with the goals and objectives of the National Drug Control Strategy and provides guidelines and future plans for counterdrug technology development efforts. The report specifically responds to enabling legislation (P.L. 101-510).

In the fight against drugs, it is clear that there will be no magic bullet, no single devastatingly effective campaign, no quick fix. A good faith estimate of how long it will take to achieve significant success is about ten years to put the worst of the drug crisis behind us. The bold, thoughtful use of advanced technology holds the promise of shortening that time and saving lives along the way.

Sincerely,

Barry R. McCaffrey
Director

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EXECUTIVE SUMMARY

The national counterdrug R&D program supports the National Drug Control Strategy. The 1996 strategy sets forth major FY 1997 program and budget initiatives supporting five principal goals:

Goal #1: motivating youth to reject illegal drugs and substance abuse,

Goal #2: increasing the safety of America's citizens by substantially reducing drug-related crime and violence,

Goal #3: reducing health, welfare and crime costs resulting from illegal drug use,

Goal #4: shielding America's air, land and sea frontiers from the drug threat, and

Goal #5: breaking foreign and domestic sources of supply.

The Counterdrug Technology Assessment Center (CTAC) within the Office of National Drug Control Policy (ONDCP) is the central counterdrug enforcement research and development (R&D) organization of the U.S. Government and has been coordinating the national counterdrug enforcement R&D program since 1992. CTAC also has supported drug abuse treatment and rehabilitation research since 1993.

CTAC's mission is to advance technologies that support the national goals by improving the effectiveness of law enforcement, drug interdiction and substance abuse treatment research. To accomplish this, CTAC provides leadership to and coordination among 21 Federal agencies participating in the national counterdrug R&D program.

CTAC prepares periodic reports to Congress entitled "Blueprints" to provide updates on the national counterdrug R&D program. This is the fourth Counterdrug R&D Blueprint Update.

MAJOR CTAC ACCOMPLISHMENTS

The following projects are some of those most successful R&D projects from this past year.

Gamma-ray Prototype System for Tanker Trucks. The design, fabrication, and testing of a transportable gamma-ray system for inspecting cargo vehicles and containers has been completed. The system was demonstrated at the ONDCP International Symposia in Nashua, NH in October 1995. It employs a collimated isotopic gamma-ray source and a vertical array of large gamma-ray detectors. It has a computer-controlled data collection and image generation subsystem capable of real-time image display. The system is capable of inspecting stationary conveyances, tanker trucks and similar cargo vehicles. Preliminary technical performance and operational tests have been conducted at Fort Huachuca, Arizona. When tests of environmental and safety parameters are completed, the system will be moved to a U.S. Customs Service southwest border location for predeployment testing. [page 3]

Cocaine Blocking Agents. An effective pharmacological treatment for cocaine addiction or overdose does not exist. Progress, however, has been made at Columbia University's College of Physicians and Surgeons in the development and testing of artificial enzymes. These cocaine antibodies, working in the bloodstream, could provide an immunization against the effects of cocaine for up to one year. Results of preliminary tests on mice have been published in scientific journals this year. [page 4]

Advanced Positron Emission Tomography (PET) Brain Scanning Research Facility opens at Addiction Research Center. The only state-of-the-art positron emission tomography facility dedicated to drug addiction research will become fully operational this fall at the National Institute on Drug Abuse

Addiction Research Center (ARC) in Baltimore, MD. The high resolution PET scanner, cyclotron, and an on-site oxygen-15 radiochemistry laboratory represent the completion of a three year project. The system will image 4 millimeter cross section by 5 millimeter depth regions of the brain and will be capable of producing extremely short half-life radio tracers. The increased resolution provided by the advanced scanner and radio tracers will allow researchers to study the interaction of crack cocaine in pleasure path regions of the living human brain -- areas never observed before. A comprehensive series of leading-edge intramural research projects is being planned by ARC research scientists to make use of this new capability to fully understand those regions of the brain susceptible to drug addiction. [page 7]

Rapid Reliable Transfer of Data on Traffickers. A state-of-the-art computer backbone communications network using asynchronous transfer mode (ATM) technology for sharing drug-related criminal information across jurisdictional boundaries has been completed in Pinellas County, Florida. This wideband network uses ATM for the first time to link seven Federal, State and local law enforcement organizations to conduct joint operations and to improve prosecution of drug traffickers. [page 8]

Exploiting Drug Trafficker Communications Patterns. An investigative tool which operates on a low cost personal computer automatically analyzes patterns of known traffickers' cellular phone and paging partners and identifies other drug trafficking organization members. This system, named GLADYS, has been completed in conjunction with the New York State Organized Crime Task Force and is being introduced to Federal, State and local law enforcement organizations across the nation. [pages 8-9]

Advancements in Tracking Technology. Project Signcutter is an advanced tracking and surveillance project being developed with the Pima County, AZ Sheriff. The system has been designed to track undercover narcotics officers, confidential informants and uncooperative targets, suspects and criminals. In addition to pinpointing suspected drug trafficking locations quickly, the system provides related information to assist in apprehension and to support prosecution, including courtroom presentations. The system can be operated by existing law enforcement personnel with limited system-specific training. [page 9]

Data Through Paging. A secure wireless communications protocol, developed in conjunction with the Secret Service and FBI, allows text, images or charts to be transmitted securely and seamlessly from any personal computer (PC) with a modem to any PC equipped with a pager. This particular capability matured at the time of the Oklahoma City bombing. To support the investigation, Hewlett Packard donated its palmtop PC's and Motorola its pagers so that the Data Through Paging protocol could be installed on several hundred prototype units. [page 9]

Project Breakthrough. Extremely accurate estimates of the amount of cocaine available for export from coca growing countries of Bolivia, Peru and Colombia are now known. The estimate of total cocaine production is the result of a comprehensive, in-country scientific analysis performed in conjunction with the Drug Enforcement Administration, Department of Agriculture and Department of State.

The results to date provide a thorough understanding of cocaine production and cocaine base yield in each growing region. With this improved knowledge, more effective strategies for targeted eradication, chemical control, and crop substitution initiatives have been formulated.

With an overall improvement in quantifying the cocaine threat, shifts in coca cultivation growing areas can be identified and more reliable measurements of interdiction effectiveness can be developed. [page 7]

Infrastructure Support. The interagency Narcotic Detection Technology Assessment team continued its evaluation of commercial off-the-shelf systems for detecting illicit drug vapor and particles. Nine systems were evaluated under a standard protocol in field tests conducted by U.S. Customs Service, U.S. Coast Guard, Department of Defense, Federal Aviation Administration, and Canadian customs engineers and scientists. Representatives from Australia, United Kingdom and Germany also participated in many of the field tests. [page 6]

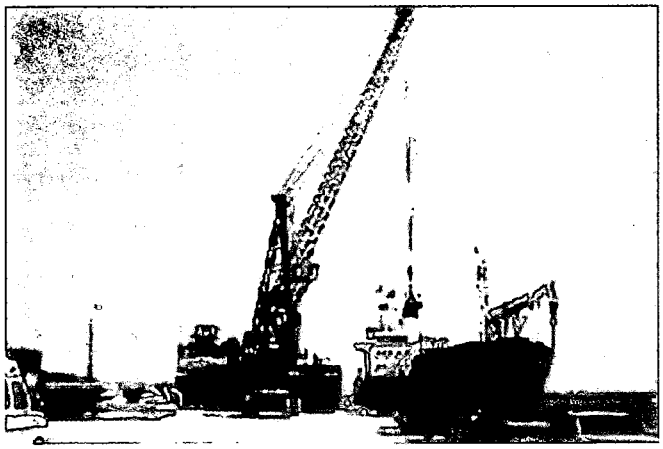
Outreach Program. CTAC sponsored its first drug abuse treatment technology workshop in August 1995. Over 130 treatment and prevention scientists conducted a peer review of the CTAC demand reduction R&D program. CTAC also sponsored its third international technology symposium on counterdrug technology in October 1995. Some 430 engineers, scientists, law enforcement professionals and academics gathered to share information on progress made in counterdrug law enforcement technology.

In 1996 one-day State and local counterdrug technology workshops were held in St. Petersburg FL, Austin TX and St. Louis MO. In total, over 875 law enforcement professionals and drug abuse research scientists have contributed to the formulation and evaluation of CTAC's R&D program this past year. [pages 9-10]

FUTURE PLANS

For 1997, the principal counterdrug R&D budgets are expected to be CTAC ($17 million) and the Department of Defense counterdrug R&D program ($21 Million) managed by the U.S. Navy. The national counterdrug R&D program will undergo a bottom up review in 1997. The results of this review will be incorporated into CTAC's FY 1998 program plan.

For FY 1997, technology development efforts will continue in the areas of nonintrusive cargo inspection, drug abuse treatment, and disrupting drug traffickers (law enforcement). Advancements in communications technology may be explored for potential benefits to drug abuse prevention. The following paragraphs summarize these plans. [Page 10]

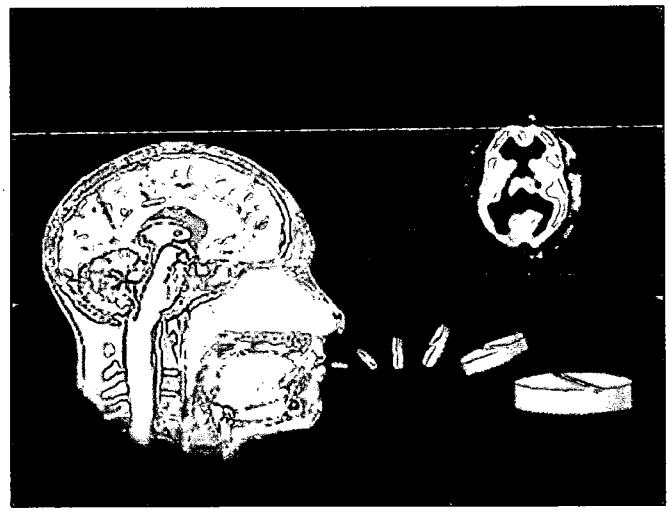


Nonintrusive Cargo Inspection Technology

CTAC plans to continue analytical efforts in conjunction with U.S. Customs Service to support the deployment of advanced technology to inspect cargo containers for illicit drugs at U.S. land border crossings and sea ports-of-entry. High priority will be placed on further development, design, fabrication and evaluation of prototype systems using gamma-ray, x-ray and other technologies. [page 10]

Drug Treatment and Rehabilitation Research

Working with the National Institute on Drug Abuse, Department of Energy (Brookhaven National Laboratory) and the Center of Addiction and Substance Abuse, CTAC has the goal of finding an effective treatment for cocaine addiction by the year 2000. CTAC has supported the regional neuro-imaging center to support advancements in medical



research. Other research initiatives seek to improve therapeutic treatment for drug abusers and to apply information technology to share progress on successful treatment modalities with researchers and treatment clinics across the nation. Specific projects to develop a cocaine vaccine and agonist/antagonist cocaine blockers will continue to receive high priority. [Page 11]

Drug Enforcement Technology

CTAC-sponsored initiatives in navigation, command and control technologies using miniaturized handheld and airborne GPS units, advanced mapping and display systems, and wireless tactical communications will be completed this year.

Technological opportunities for exploiting drug traffickers communications and financial operations with advanced drug enforcement technology will continue to receive high priority next year. [page 12]

Infrastructure Support

CTAC plans to continue supporting the Narcotic Detection Technology Assessment program led by U.S. Customs Service. This program will be expanded from illicit drug vapor/particulate detection systems to include evaluations of bulk detection technology (e.g., x-ray and neutron systems).

CTAC is working with Tennessee Valley Authority to transition advancements in counterdrug capabilities and equipment to the law enforcement community at-large. Specific initiatives are planned to transition:

- ATM technology for seamless, wide bandwidth, law enforcement networks supporting multiple jurisdiction task forces,
- systems to analyze cellular phone/pager calling patterns to target traffickers,
- improved algorithms for computer-based systems to disrupt money laundering operations,
- multi-level database access tools for finding current relevant information within a multitude of databases,
- wireless technology that supports the acquisition of data and timely retrieval of information in the field,
- integrated computer and network technologies that link drug treatment centers for evaluating drug control efforts in the areas of treatment and education, and
- applications of information technologies to improve the coordination of counterdrug operations. [page 13]

Outreach Program

The next international counterdrug technology symposium is planned for July 1997. [pages 13-14]

Appendices

Appendix A provides highlights from legislative language. Appendix B provides a list of all counterdrug R&D projects by agency for FY 94 and FY 95. Appendix C summarizes ongoing counterdrug R&D projects being sponsored by the Department of Defense counterdrug technology program. Appendix D provides the listing of short, medium and long term scientific and technological needs. Appendix E summarizes CTAC's Outreach Program and lists those proceedings from the CTAC-sponsored technical symposia. Appendix F provides a list of Articles and Publications of Interest. Appendix G provides the U.S. Customs Service Development and Acquisition Plan for Border Port Inspection Technology.

1. INTRODUCTION

The Counterdrug Technology Assessment Center (CTAC) is the central counterdrug enforcement research and development (R&D) organization of the U.S. Government. CTAC was established within the Office of National Drug Control Policy and has been coordinating the counterdrug R&D program for the Federal Government since 1992. In 1993, CTAC was directed to include drug abuse rehabilitation and addiction research in the program in addition to law enforcement-related technology. CTAC prepares periodic reports to update the national counterdrug R&D program. This report is the fourth Counterdrug R&D Blueprint Update and provides the status of the national counterdrug R&D program, descriptions of technology development and infrastructure support projects, and plans for future counterdrug R&D initiatives.

The national counterdrug R&D program supports the National Drug Control Strategy. The 1996 strategy set forth major FY 1997 program and budget initiatives supporting five principal goals:

- motivating youth to reject illegal drugs and substance abuse,
- increasing the safety of America's citizens by substantially reducing drug-related crime and violence,
- reducing health, welfare and crime costs resulting from illegal drug use,
- shielding America's air, land and sea frontiers from the drug threat, and
- breaking foreign and domestic sources of supply.

The national counterdrug R&D program is based upon the premise that the introduction of advanced technologies can enhance the effectiveness of counterdrug law enforcement, strengthen substance addiction medical research, enhance interdiction and international activities, and improve the overall use and safety of personnel.

This report provides a summary of the national counterdrug R&D program and describes those plans for the next set of R&D initiatives. Appendix E to this report contains updates to the priority listing of short-, medium-, and long-term scientific and technological needs.

1.1 Counterdrug Technology Assessment Center

CTAC's mission can be segmented into four areas:

- identify the short-, medium-, and long-term scientific and technological needs of Federal, State and local drug enforcement agencies,
- develop a national counterdrug R&D strategy that validates technological needs, prioritizes such needs according to technical and fiscal feasibility, and sets forth a plan (including budget) to test and develop the highest priority technology projects,
- implement a national counterdrug R&D program, including technology development in support of substance abuse addiction and rehabilitation research, and
- coordinate counterdrug research and development activities, identify and remove unnecessary duplication.

The motivation to establish CTAC and to appropriate a separate annual R&D budget for CTAC stemmed from an understanding that funding shortfalls existed in counterdrug R&D and that a central organization should be established to manage a national counterdrug R&D program. It also was recognized that CTAC-funded R&D projects would:

- require multi-year funding to complete,
- be directed toward advanced technology applications providing the broadest support to the various counterdrug activities of Federal, State and local agencies,
- not be a substitute for projects conducted with other agencies' internal funding, and
- address gaps in technology and fulfill high priority "out of cycle" funding requirements.

With the assistance of the law enforcement community, CTAC-sponsored infrastructure initiatives assess the technical complexity and cost aspects of planned and ongoing prototype projects. These initiatives are performed to assure that resulting systems have a realistic initial acquisition cost, low maintenance and support costs during their

operational lives, and an operational simplicity for user personnel.

1.2 The National Counterdrug Research and Development Program

The national program of enforcement-related counterdrug R&D consists of those R&D projects being performed by 14 of the 21 agencies with counterdrug missions. Due to the synergy of technologies used in detecting illicit drugs and those used in detecting explosives and other contraband, some agencies, such as, Federal Aviation Administration (which has a limited counterdrug mission) participate in the national R&D program to follow developments which may also apply to improving counter-terrorism missions. Similarly, other agencies do no R&D but participate in the national R&D program to benefit from its accomplishments. The principal investments in counterdrug R&D come from the Department of Defense (DoD) and CTAC. A summary of the DoD counterdrug R&D program is included in Appendix C. A database of all counterdrug research and development projects by agency is now provided on-line through the DoD counterdrug technology development program office.

Projects within the national R&D program have been organized into four technical thrusts: tactical technologies, nonintrusive inspection, wide area surveillance, and demand reduction. CTAC began an underpinning infrastructure program which fosters close working relationships among Federal, State and local law enforcement, prevention and treatment agencies, and the research and development laboratories from the Government, academic and private sectors.

The infrastructure program includes:

- the establishment of testbeds that emulate the operational environment in which future systems will be required to operate,
- a team of engineers and scientists to perform analytical evaluations in conjunction with user personnel to compare technical system performance using accurate measures of effectiveness and scientific comparison criteria, and
- state-of-the-art instrumentation and facilities to evaluate law enforcement technology prototypes and to enhance the performance of medical research teams working in the area of drug addiction treatment and prevention.

CTAC sponsors an outreach program consisting of technical symposia and user workshops to inform law enforcement and demand reduction agencies of progress on the development of these advanced technologies and to assist users in inserting appropriate technologies into their daily operations.

Each effort to develop technology, establish testbeds, perform analysis, or reach out to the public has been keyed to one overriding objective - *the development and application of better technology to fight the drug problem in the United States.*

2. PROGRAM SUMMARY

This section summarizes the program highlighting those accomplishments achieved since the last Blueprint in April 1995. The concentration of discussions in this section concerns CTAC-sponsored R&D projects.

Since potential counterdrug technology transcends many missions, both enforcement and treatment related, CTAC has attempted to strike a balance in consonance with the National Drug Control Strategy to pursue both supply and demand reduction research and development opportunities.

Supply reduction technology generally relies on the disciplines of physical, biological, chemical and information sciences. To support law enforcement counterdrug missions, CTAC has focused on integrating advancements in these technologies and applying improved capabilities to tactical operations where we can use equipment to perform more efficiently many of the highly dangerous surveillance and forensic data collection activities.

Demand reduction technology relies upon the disciplines of biochemistry, psychology, physiology and social sciences. CTAC's thrust in demand reduction applies advancements in medical research to improve therapeutic treatment for drug abusers and information sciences technology to exchange information on successful prevention and treatment

modalities among clinics networked across the nation.

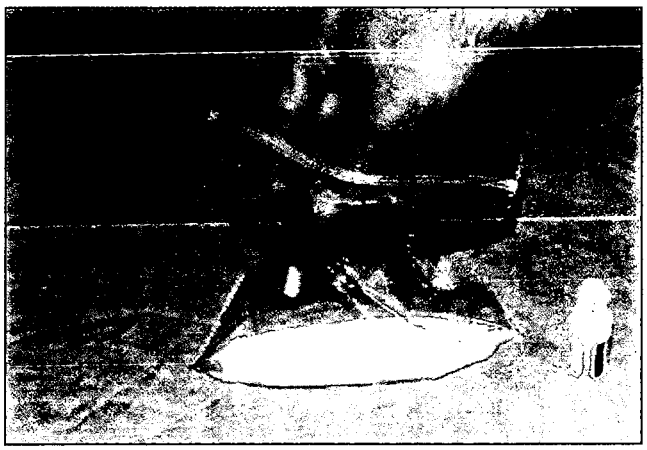
2.1 CTAC-Funded R&D Projects

This section highlights some of the more successful CTAC-sponsored projects.

Antibody-Based Drug Detection Kits

In conjunction with the FBI, CTAC funded a research project to apply antibody-based technology for detecting trace amounts of cocaine under field conditions. These detection kits are used in the field to rapidly and accurately identify drug-related incriminating evidence at a crime scene. Samples are taken back to the forensic laboratory for court accepted confirmation with gas chromatograph and mass spectrometry equipment.

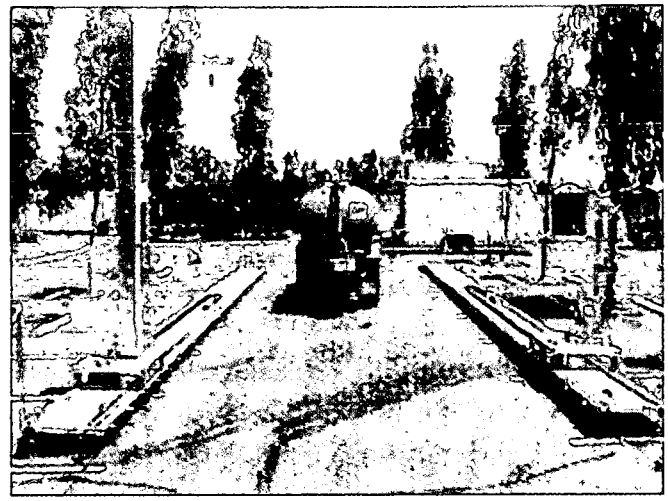
During field evaluation by the FBI, the kits were used to detect traces of cocaine on the cellular phone, hands and plane tickets of a cocaine cartel finance manager. A felony conviction was obtained and several bank accounts totaling over $7 million in cash were seized. Last year, the test kits were evaluated by Narcotics Detection Assessment Team.



The test kits are now commercially available and the procedure for sampling and confirmation has been widely accepted at the Federal, State and local levels - including prisons, parole and probation offices, and in the workplace. The full operational procedure for using the kits is being presented by the Corning National Center for Forensic Science at the American Academy of Forensic Sciences 1996 annual meeting.

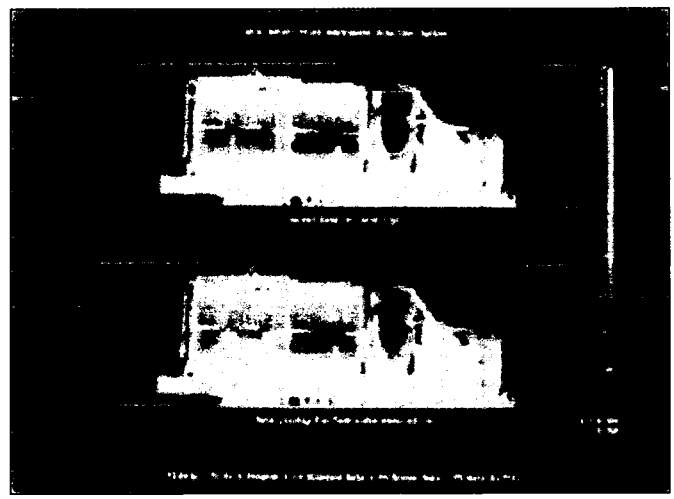
Gamma-Ray Prototype System for Tanker Trucks

A low-cost high-throughput prototype system was



developed to inspect tanker trucks at U.S. border crossings. The prototype uses large, highly efficient gamma-ray detectors which make it possible to scan the tanker truck with a very low intensity gamma-ray field.

The system was tested with packages of up to 100 pounds of cocaine and cocaine simulant by U.S. Customs Service and Department of Defense personnel during March 1996 at the Thunder Mountain Evaluation Center, Fort Huachuca, AZ.



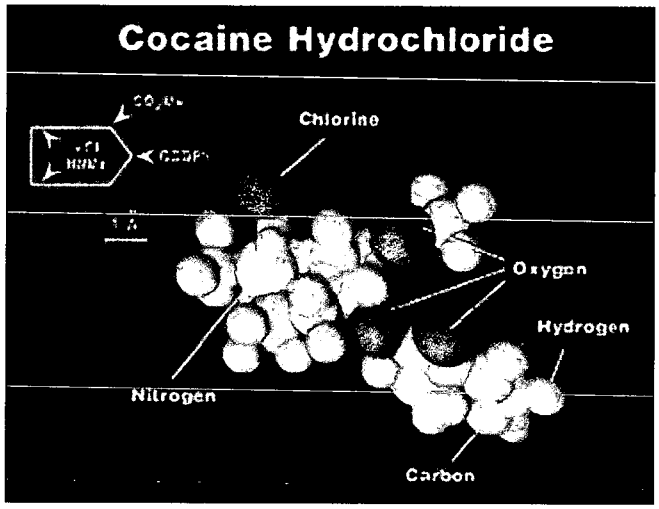
Testing included locating stashes hidden inside the tank, the cab, at several locations in and on the undercarriage.

Using a gamma-ray system for inspecting parked vehicles and slow railroad cars (speeds of 5 to 25 mph) for illicit drugs also could be technically feasible. The optimum detector resolution and gamma-ray field strength for each target and speed currently are being investigated. Additional testing also is planned to address both environmental and safety aspects of an operational system configuration.

Cocaine Antibodies

Cocaine addiction has defied medical treatment despite decades of effort. Cocaine blocks the turn-off switch for the sensation of pleasure (the removal of dopamine from a neural synapse in the brain) and thus far, drugs that can displace cocaine in the brain still block this turning off process.

Some 20 medications to combat cocaine have been studied in human trials and the few that have proved



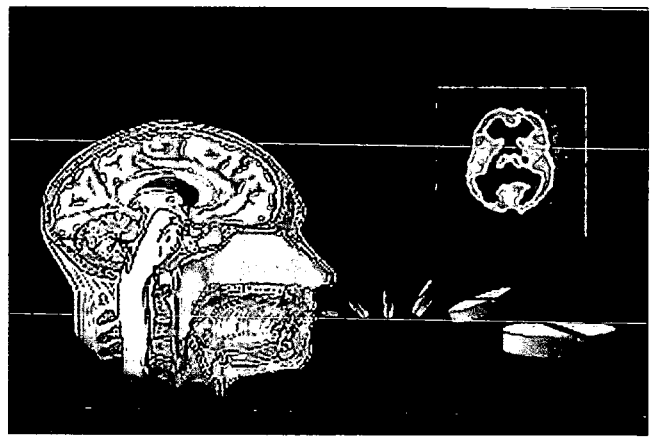
effective only seem to work in small groups of patients. CTAC is working in conjunction with National Institute on Drug Abuse, the Center of Addiction and Substance Abuse and Columbia University research scientists to develop a cocaine treatment effective on a wide range of patients.

Regardless of how cocaine is abused - nasal snorting, inhalation of crack, or intravenous injection - the drug must pass through the blood stream to reach the brain. Under CTAC funding, research scientists at Columbia University College of Physicians and Surgeons are developing artificial enzymes that create antibodies in the bloodstream to metabolically deactivate cocaine by hydrolysis at its benzoyl ester group. This strategy does not rely on the details of the site of action of cocaine in the brain but rather intercepts cocaine before it gets to the brain. The laboratory-made catalytic antibodies are designed to home in on specific targets, but instead of neutralizing the targets, the catalytic antibodies trigger a chemical reaction to split the cocaine into two inactive ingredients. Nine catalytic antibodies have been formulated and tested.

Antibody treatment could provide a six month to one year vaccination against relapse for cocaine and crack addicts who seek treatment.

Neuro-Imaging Center for Drug Abuse Research

CTAC has established a regional neuro-imaging center to support advancements in medical research. Other research initiatives seek to improve therapeutic treatment for drug abusers.



Drug Evaluation Network System

CTAC applies information technology to share progress on successful treatment modalities with researchers and treatment clinics across the nation. The National Evaluation of Substance Abuse Treatment (NESAT) is used to respond rapidly and practically to the gaps in our knowledge about treatment effectiveness to provide information needed to make informed decisions about the expansion of treatment capacity.

Major objectives of the study are to describe individuals who enter treatment in terms of their demographic characteristics, treatment history, social-psychological characteristics, and drug/alcohol use and dependence; and to describe the characteristics of treatment programs in terms of their organizational profile, capacity, staffing, services offered, environment and treatment philosophy. These steps will be used to determine the range of effectiveness of treatment programs; which program characteristics are predictive of program success; and which treatment elements are predictive of patient success. The sample size of the NESAT study will increase from 200 programs and 2,000 clients to 300 programs and 3,000 clients.

Evaluation of Treatment Technologies for Court Diversion of Juvenile Offenders

In response to recent increases in drug related youth crimes and the number of juveniles arrested on drug related charges, CTAC is sponsoring a study to evaluate the treatment technologies used in court diversion programs for juvenile offenders (ages 15 to 17.) This study, being conducted at the Medical College of Pennsylvania, Albert Einstein Health Care Network and Hahnemann University, employs an experimental design to evaluate two approaches to court diversion in comparison with a non-diversion "treatment as usual" control condition. The evaluation will include methodical outcome assessments and process analyses for all three study conditions. One unique feature of this study is that the research subjects have been randomly assigned to the program after having been adjudicated delinquent on the basis of a drug related offense and shown evidence of a pattern of illicit drug use.

Clinical Study of l-Glutamine as a Treatment for Substance Abuse

Another CTAC-sponsored study by the Medical College of Pennsylvania and Hahnemann University examines the use of compounds containing l-Glutamine and Vitamin B Complex in reducing the craving for cocaine and alcohol among individuals receiving outpatient treatment for substance abuse. Study participants will be assigned to receive either l-Glutamine with Vitamin B Complex, Vitamin B Complex alone, or a placebo for a period of one year.

Tracking and Surveillance and Command, Control, and Communications

Tracking and surveillance operations are extremely important to effectively disrupt drug trafficking and improve the safety of law enforcement personnel. Several initiatives have been pursued to improve tracking and communications technology.

- A handheld GPS tracking system has been developed to allow police to track vehicles and improve drug-related criminal investigations. One prototype system is being field tested by the Yonkers, NY Police Department's Narcotics Division.

- During similar field trials, a felony drug conviction was obtained by the Fulton County Sheriff's Office in Rochester, Minnesota. A warrant based on GPS coordinates for a rural location with no address was obtained from a handheld GPS prototype. That was the first reported use of GPS for that purpose.

- An airborne counterpart to the land based system is being developed by the Mayo Clinic in Minnesota. The system will be field tested for drug law enforcement missions by the Minnesota Highway Patrol. Modifications are being studied for expanding this capability including testing the concept in more complex urban environments in support of the FBI.

- A location and tracking system was developed in conjunction with the FBI that uses radio frequency transmissions from a concealed transponder. The transponder remains in semi-sleep receive mode until activated by a query from the host system. When queried, the transponder emits a short-duration data burst making the system virtually immune to detection from scanners.

- Electromagnetic propagation prediction models are being developed in conjunction with the FBI to predict and optimize the use of cellular communications for tracking, surveillance and communications in urban and rural environments.

- In conjunction with DEA, an enhanced real-time voice identification system was completed for use on a personal computer with an easy-to-use

interface. The system allows one to monitor drug suspect conversations and automatically identify voices.

- An acoustic surveillance system prototype that extends the range and discriminates against interfering noise sources was completed this year. The prototype system has been modified to suit a particular requirement and is planned for procurement by the FBI next fiscal year.

2.2 Infrastructure Support Initiatives

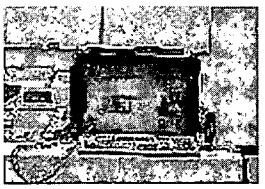
The CTAC infrastructure initiatives support the entire counterdrug community. Each item addresses the most pressing technological limitations being encountered by law enforcement professionals and research scientists today.

Effective near-term fielding of technology requires the capability to perform independent technical assessments and evaluations of prototype technology in realistic operational environments. These evaluations must consider acquisition strategies, as well as logistics, reliability, training and cost.

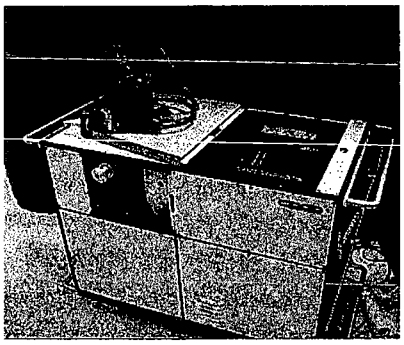
Narcotics Detection Technology Assessments

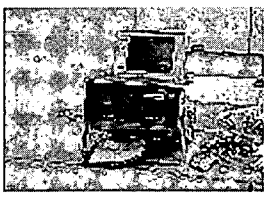
The Narcotic Detection Technology Assessment (NDTA) team was formed in 1992 by the Contraband Detection Working Group of the Science and Technology Committee to independently assess commercially available and emerging prototype narcotic detection equipment.

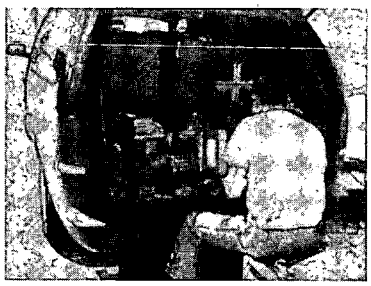
Through the NDTA program, CTAC is working to leverage the research and development efforts undertaken by industry to meet the technology needs of Federal, State and local law enforcement agencies engaged in counterdrug activities. CTAC's primary objective regarding the NDTA program is to quantitatively evaluate the detection performance of chemical-based narcotic detection equipment. The secondary objective is to provide qualitative information on normal operational aspects of the systems. This information is "Law Enforcement Sensitive," and is distributed in the form of benchmark evaluation reports to interested agency representatives on an "Official Government Use Only" basis. Independent evaluation tests are scheduled to be conducted on an annual basis. Frequency of testing is adjusted based on advances in drug detection technology. While current test protocol concentrates on heroin and cocaine, similar protocol can be developed to evaluate system performance against other drugs and contraband of interest.

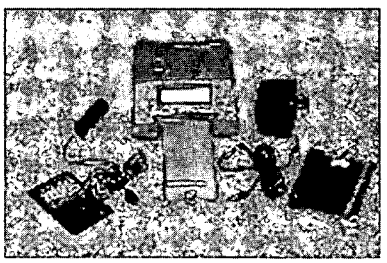


These tests constitute the first comprehensive, controlled, multi-agency performance assessment of drug detection systems in operational environments. Technical and scientific support is provided by engineers and scientists from U.S. Customs Service, Houston Advanced Research Center and Argonne National Laboratory. Over the past four years, U.S. Customs Service, U.S. Coast Guard, FBI, FAA, DEA, DoD and Revenue Canada have invested their own fiscal and personnel resources to make this project a success. Equipment tests have been conducted at major ports-of-entry from San Ysidro, CA and El Paso, TX to JFK Airport, NY and the Port of Miami, FL.









At the time NDTA began, there were only two commercially available chemical based narcotic detection systems with two additional systems under development. In 1994, CTAC sponsored the first

series of formal tests under the NDTA program to evaluate four systems. By 1995, six more manufacturers submitted newly developed drug detection systems for evaluation under the NDTA program. There has been tremendous growth in the field and some thirty different drug particle and vapor detection systems now are in varying stages of prototype development. Under NDTA selection criteria, 17 of these systems are eligible for evaluation in 1996 with another 10 systems in the pipeline for evaluation next year.

The first series of tests was completed in November 1994. A report of the four instruments tested, *"Benchmark Evaluation Studies of Drug Detection Devices, Volume 1"* was distributed to Federal, State and local law enforcement agencies. Tests on five additional systems were completed in February 1996 and documented in the second report, *"Benchmark Evaluation Studies of Drug Detection Devices, Volume 2."*

The first series of evaluations of commercially available fixed manual and automated detection x-ray systems will be completed in conjunction with the U.S. Customs Service, Revenue Canada and Argonne National Laboratory in July 1996.

Project Breakthrough

The Drug Enforcement Administration led a multiple agency initiative, Project Breakthrough, to establish precise estimates of Andean Ridge coca crop yields and leaf alkaloid content and to measure the efficiencies of cocaine processing methods in Bolivia, Colombia and Peru.

Breakthrough completed the examination of cocaine production in Bolivia in 1993 and in Peru in 1995. It was found that annual coca leaf yield in the Chapare region of Bolivia averaged 2.7 metric tons per hectare. The annual yield for all coca growing areas in Peru was found to average 1.8 metric tons per hectare. All coca leaf from extensive samples taken in Bolivia and Peru was found to be of the same species, Erythoxylum coca. Illicit laboratory processors were also examined and found to have efficiencies of 44% in Peru and 45% in Bolivia. In both countries, one primary method of cocaine base processing was employed. In Colombia, Project Breakthrough examinations will be completed in 1997.

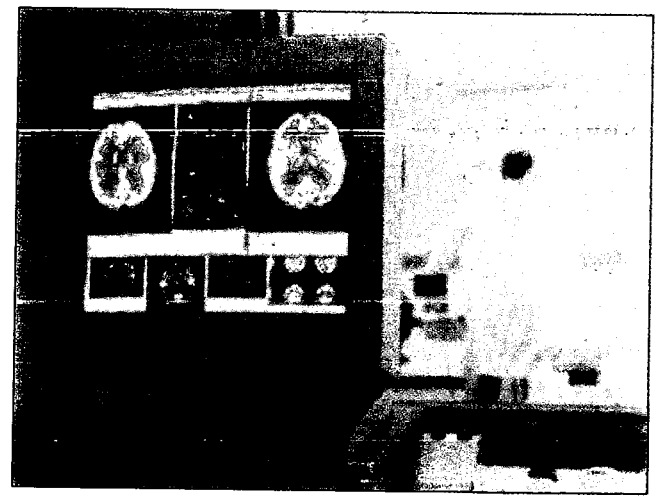
The results to date provide an understanding of cocaine production and cocaine base yield in each growing region. With this knowledge, new strategies for targeted eradication, chemical control, and crop substitution initiatives have been formulated.

With an overall improvement in quantifying the cocaine threat, shifts in coca cultivation growing areas can be identified and more reliable measurements of interdiction effectiveness can be developed.

Brain Scanning Technology

CTAC sponsored the development of an advanced positron emission tomography (PET) research facility in conjunction with the Addiction Research Center (ARC) at National Institute on Drug Abuse (NIDA).

The goal of this program is to extend the knowledge



of the underlying biological causes and effects of substance abuse in the brain.

The Addiction Research Center is the only Federal facility *totally dedicated* to drug abuse research. The new facility consists of a high resolution PET scanner, cyclotron, and radiochemistry laboratory. State of the art PET scanners can resolve 6-8 mm images. The new scanner was completed this year

and can image 4 mm cross section by 5 mm depth cubic regions of the brain. The new scanner at ARC allows research scientists to accurately measure drug interactions in brain regions never observed in living tissue before.

The cyclotron and oxygen-15 radiochemistry laboratory will be completed and operational by December 1996. Several advanced research projects are under consideration by the substance abuse intramural research program at NIDA. An advisory committee will oversee the research program.

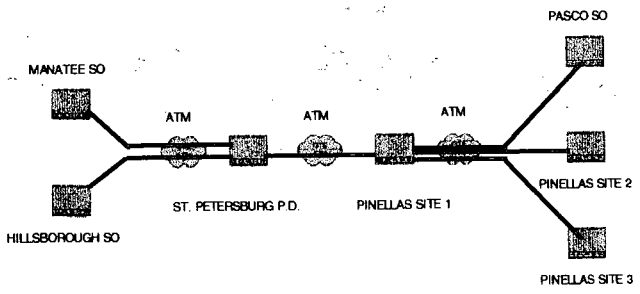
Technology Testbeds

A technology testbed program was initiated to establish "laboratories in the field" where objective data could be collected from independent field evaluations on advanced technology prototypes in an unbiased environment.

The testbeds provide an infrastructure of equipment and personnel and are fully instrumented, largely centralized locations from which scientists, engineers, law enforcement personnel and medical researchers can test and evaluate specific prototype technologies. The following testbed projects were completed since the last Blueprint update.

West Florida Counterdrug Information Network

A prototype system using asynchronous transfer mode (ATM) technology is being tested by a Florida law enforcement consortium led by the Pinellas County Sheriff's Office. University of Tennessee and other research scientists manage the testbed. The



testbed is comprised of a secure, high speed, wideband, ATM digital communications network. The testbed, opened in August 1995, links the narcotics bureaus of the major law enforcement agencies in the Tampa - St. Petersburg region. The network allows consortium members, consisting of the main headquarters of Pinellas County Sheriff's Office and its Narcotics Bureau, the St. Petersburg Police Department's Narcotics Bureau, the State's Attorney's Office, and the Narcotics Bureaus of the Pasco, Manatee and Hillsborough County Sheriff's Departments, almost instantaneous access to the databases of participating agencies through remote login, electronic mail and file transfer capabilities.

This digital network draws upon the most advanced data access, storage and fusion technologies and has been used to support several ongoing investigations while being developed.

GLADYS Call Processing System

Illegal clone cellular phones are increasingly being used as a standard accessory for members of drug organizations from smugglers to distributors to street dealers. The GLADYS system was developed in conjunction with the State of New York Organized Crime Task Force to allow law enforcement officers to identify individuals who may be involved in drug related activities by observing their communication

relationships to other individuals who are already under investigation. Through the definition of groups, key members, and clusters, the system can monitor basic, first and second order relationships among subscribers (telephone company land line phones) and mobile, cellular telephone users.

GLADYS captures the text output streams of telephone company billing computers. The system receives and stores only parametric data such as the telephone number, date, time, and duration of a call, not the conversation. Through a graphical user interface, system users can execute GLADYS functions to label subscribers or telephone users as members of definable suspect groups, including key members and clusters of members linked to various key members. The system can then be used to identify communications patterns within and between groups.

Telephone traffic logs available from the telephone company are the major source of data inputs to GLADYS. In a current operation, the GLADYS system is being used to process input subsets of 2,000 targeted calls per day covering a particular sector of subscribers.

GLADYS was developed using commercially available, off-the-shelf software and operates on either a pentium or 486/66 PC. The system is now being used extensively by the Organized Crime Task Force in the state of New York. CTAC plans to make the basic system available to a wide range of drug enforcement agencies over the next year.

GPS-Based Tracking Systems

Two testbeds are exploring advancements in tracking and surveillance:

- The Narcotics Division of the Yonkers NY Police Department is evaluating a GPS-based tracking and surveillance system integrated with an automated two-dimensional mapping information system.

- Project Signcutter is being field tested in conjunction with the Pima County Arizona Sheriff's Department. The project integrates synergistic technologies of geographic information systems, data communications and GPS to support counterdrug tracking and surveillance missions.

Data Through Paging

A wireless communications protocol has been developed in conjunction with the FBI that allows text, images and charts to be transmitted securely and seamlessly from any personal computer (PC) with a modem to any PC equipped with a pager. This particular capability matured at the time of the Oklahoma City bombing. In support of the investigation, Hewlett Packard donated its palmtop PC's and Motorola its pagers so that the Data Through Paging protocol could be installed on several hundred prototype units.

The wireless protocol allows binary data, bit maps, wave forms and text to be transmitted and received securely using DES, triple DES and other encryption algorithms over existing conventional wireless networks. The combination of the protocol with suitable transmit computer, wireless network, and handheld or laptop PC allows for the transmission and reception of sensitive and secure data including mug shots, composites, snap shot video, medical wave form data, and text virtually everywhere in the United States.

2.3 Outreach Program

As part of CTAC's coordination function, an outreach program was begun to bring scientists and engineers in the development community together with those system users and law enforcement professionals within the Government involved in counterdrug operations. Four major technical counterdrug symposia have been held by CTAC:

- Counterdrug Law Enforcement: Applied Technology for Improved Operational Effectiveness International Technology Symposium, October 24-27, 1995, Nashua, NH,

- Drug Abuse Treatment Technology Workshop, August 15-16, 1995, Baltimore, MD,

- Tactical Technologies and Wide Area Surveillance International Symposium with U.S. Department of Energy, Argonne National Laboratory, November 2-5, 1993, Chicago, IL,

- Contraband and Cargo Inspection Technology International Symposium with National Institute of Justice, October 28-30, 1992, Washington D.C.

One-day technology workshops have been held this year to address specific user needs and technological opportunities.

- PERF/CTAC Technology Seminar, March 14, 1996, St. Petersburg, FL,
- ONDCP/CTAC Regional Technology Workshop, April 23, 1996, Austin, TX,
- ONDCP/CTAC Regional Technology Workshop, July 17, 1996, St. Louis, MO.

Additional workshops are scheduled for several other locations later this year.

3. FUTURE PLANS

Based upon a long-term (10 year) comprehensive, coordinated systems-based approach, CTAC has formulated a multi-year R&D program for counterdrug technology development consistent with the goals and objectives of the National Drug Control Strategy. CTAC plans to continue providing crucial R&D where substantial benefits to drug supply or demand reduction can be derived. The use of technology-based testbeds has proven invaluable in applying state-of-the-art technology to drug-related needs of law enforcement at all levels.

The near-term plan includes completion of the follow-on phases of successful research projects. A bottom up review of the national counterdrug R&D program is being conducted to assess where CTAC's limited resources can best be applied. In the interim, CTAC plans to complete most follow-on projects in FY 1997. Additional efforts within the testbed program will address limited scope pilot projects to assist in inserting counterdrug technology or for proof of concept demonstrations.

3.1 Nonintrusive Inspection

CTAC priority: to develop technologies for nonintrusive searches of containers or other cargo reaching U.S. shores[1]

Our most pressing goal in nonintrusive inspection is to develop a rapid, automated system to inspect shipment and cargo containers for hidden illicit drugs without physically removing all the contents for manual inspection. A family of technologies is needed to provide systems capable of inspecting the full spectrum of conveyances, such as cars, break-bulk shipments, and railroad cars.

The CTAC program will address overcoming those limiting technologies, operational constraints and cost factors for using advanced "high technology" systems for customs inspections. CTAC plans to continue the narcotics detection technology assessment project for determining performance limitations of off-the-shelf, commercially available drug detection equipment. This project supports the U.S. Customs Service, Federal Aviation Administration, U.S. Coast Guard, Drug Enforcement Administration, and Federal Bureau of Investigation efforts to determine those commercial systems best suited for their short-term contraband detection needs. Technical feedback to manufacturers allows them to develop improved products with the proper equipment.

CTAC plans to continue drug signature phenomenology analysis along two lines: nuclear interrogation and chemical detection of vapors and particles. These analyses provide the basis for determining the technical feasibility of using many defense-related technologies for detecting illicit drugs. CTAC support will be provided to the Coast Guard and Customs Service in developing improved vapor and particulate detection systems, including biological, gas chromatographic and mass spectrometric technologies. Concentration on portable and handheld devices is planned.

3.2 Demand Reduction

CTAC priority: to support ongoing programs that strengthen substance abuse medical research[1]

It is estimated that 2.1 million people in the United States (nearly 1% of the population) use cocaine on a weekly basis and that several hundred thousand use it daily. At present, cocaine treatment options are limited to counseling, psychotherapy, and participation in self-help groups; effective

[1] Barry R. McCaffrey opening statement to the House Committee on Appropriations, Subcommittee on Treasury, Postal Service and General Government, April 17, 1996

pharmacotherapies for cocaine addiction simply do not exist.

CTAC and NIDA have the goal to: replace ideology in the treatment of drug addiction with science by the year 2000. Working toward this goal, CTAC has been investigating new approaches to treat cocaine addiction with newly developed antagonist drugs and artificial catalytic antibodies that destroy the drug immediately after it enters the blood stream and before it reaches the brain. Hand-in-hand with developing new drugs is the development of state-of-the-art equipment for medical researchers to evaluate new therapies.

CTAC's demand reduction technology initiative provides support to: (1) development of artificial enzymes which reduce the serum cocaine concentrations by destroying the drug immediately as it enters the blood stream, before it reaches the brain, and (2) the investigation of a family of compounds for their applicability as either an agonist or antagonist therapeutic drug to work within the brain to block the effects of cocaine.

Support for developing and evaluating improved therapeutic treatments for drug abuse treatment will continue. For example, Columbia University College of Physicians and Surgeons is developing artificial enzymes that interfere with the cocaine molecule's ability to provide drug-related sensations. Research into developing cocaine antagonists and substitutes also is being sponsored. During this phase, the research team will obtain pharmaceutical support to synthesize the therapeutic agents in larger and purer quantity to undergo FDA testing and approval. Additional research includes performing a series of experiments using positron emission tomography scans to observe the effects of these agents on Rhesus monkeys.

CTAC's agonist or antagonist therapeutic drug technology program employs a novel technology based on sophisticated engineering approaches to develop either a pure cocaine antagonist which will have no stimulant effects of its own but which will block the actions of cocaine or an agonist which has mild stimulant effects. This approach is somewhat analogous to the use of methadone in treating heroin addicts but would be much more effective. The pure cocaine antagonist would have immediate application in treating cocaine overdoses.

The research and testing for these new drugs will benefit greatly from the high resolution PET scanner and radiochemistry laboratory at the Addiction Research Center at Baltimore, MD.

A three-year program to develop a computer-based drug treatment research information network will come on-line this year. This network will improve the way drug abuse treatment is administered by facilitating collaboration among various research efforts, identifying the most successful prevention and treatment programs, and providing real time communications and analysis among the various clinics and research centers.

For drug testing applications, a research team led by the Naval Research Laboratory is evaluating using a subject's hair, sweat or saliva for monitoring drug use under a variety of conditions. Such issues as passive exposure, false identification of drug use, and matrix bias among individuals are being considered to evaluate the best biological matrix to use in developing a noninvasive alternative to testing urine. With this year's funding, CTAC plans to complete development of a prototype system to integrate the detection of illicit drugs with geopositional sensor and communications subsystems for transmission of positional and drug abuse status data to a remote location.

Capabilities will be developed to monitor inmates for drug abuse via bracelets or patches which detect the illicit drugs in the hair or sweat of the subject.

An ongoing study of first-time offenders in the New Orleans Parish, Louisiana to evaluate the best methods for detecting drug use by parolees in the criminal justice system will be completed this year.

CTAC plans to begin a two-year research study to determine the therapeutic value of acupuncture for treatment of drug addiction.

While research efforts continue, little if any work is being done to improve the diagnostic equipment used by these research scientists. CTAC plans to continue equipment development efforts to increase the resolution and image enhancement capabilities for

positron emission tomography and its use in evaluating those sectors of the brain that respond to addictive drugs. CTAC established a regional neuro-imaging center at Brookhaven National Laboratory in conjunction with NIDA to support these type of advancements in medical research.

3.3 Tactical Technologies

Goal 2: Increase the safety of America's citizens by substantially reducing drug-related crime and violence[2]

CTAC plans to continue the development of the key prototype components of an advanced, mobile command and control system. These applications will be integrated into a common backplane of the personal communications system (PCS).

A GPS tracking system has been developed to allow police to track their vehicles and improve drug-related criminal investigations and serves as the centerpiece of the PCS architecture. Modifications for expanding this capability include operating in more complex urban environments.

CTAC plans to continue computer science technology development to promote sharing drug-related criminal information across jurisdictional boundaries. Several strategically located test sites have been selected for developing this technology and for transitioning proven capabilities to Federal, State and local organizations.

Development of a police cruiser with computer assistance to extend vision and sensory capabilities of the officer will be fielded. The vehicle will have a real-time control system and capabilities to track and conduct surveillance missions on drug trafficking organizations.

CTAC and the FBI have issued a Broad Agency Announcement (BAA) for advancements in forensic sciences. Initial funding of proposals began in FY 1996. Projects successfully completing initial research will continue to receive funding in FY 1997. Many of the projects under the BAA address needs of State and local forensics laboratories.

The use of airborne, ground and seaborne instruments is being investigated to provide real-time reconnaissance information. Potential testbeds are located with the FBI (NY) and Coast Guard (Caribbean). Prototypes to be tested include specialized robots and unmanned ground and air vehicles outfitted with sophisticated sensor suites and communications systems.

3.4 Wide Area Surveillance

Goal 5: Break foreign and domestic drug sources of supply[2]

CTAC plans to complete Project Breakthrough. This three-year project is being conducted by the Agricultural Research Service, Drug Enforcement Administration, and Department of State to improve illicit crop production estimates and evaluate effectiveness of crop eradication and substitution programs in South America. Estimates for Peru and Bolivia have been completed. The compilation of estimates for Colombia will complete this project.

3.5 Infrastructure Support

Provide a common framework to ... build a unified American counterdrug front[3]

The infrastructure support program provides testbeds, instrumentation and engineering support to perform testing of prototypes in operational environments. While Federal law enforcement agencies provide the lead for much of the testing program, many of the prototype tests will include State and local organizations.

CTAC plans to continue the infrastructure support program in FY 1997 with a concentration on nonintrusive inspection technologies, computer science (for information sharing in law enforcement applications and among drug abuse treatment researchers and treatment facilities), and benchmark comparison of similar systems under development.

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[2] 1996 National Drug Control Strategy

[3] Barry R. McCaffrey opening statement to the House Committee on Appropriations, Subcommittee on Treasury, Postal Service and General Government, April 17, 1996

In FY 1996, a series of tactical technology testbeds began operation. These facilities are deployed along the Southwest border, Southeastern and Northeastern United States, and the West Coast. They evaluate system concepts in the field in conjunction with Federal, State and local agencies operating in these regions. Many of the prototype systems developed under CTAC funding will be evaluated at these locations. Some of the prototypes being evaluated include advanced mapping systems, wireless networks, communications systems, and unmanned air and ground vehicles. During FY 1997, other modules, including systems for intercepting traffickers communications and recording remote conversations will be tested as well.

CTAC will support ongoing independent, objective and unbiased benchmark testing and technical assessments of competing technologies and systems under consideration for development or procurement.

CTAC also plans to continue providing technical and analytical support to the Science and Technology Committee and its working groups.

CTAC is working with Tennessee Valley Authority to transition advancements in counterdrug capabilities and equipment to the law enforcement community at-large. An adaptive, innovative "reinvention lab" concept involving Federal, State and local government agencies, universities and industry has been created to support the management and transition of counterdrug R&D that hold the prospect for affordable deployment. Examples of specific initiatives planned for transition through this concept include:

- ATM technology for seamless, wide bandwidth, law enforcement networks supporting multiple jurisdiction task forces,
- systems to analyze cellular phone/pager calling patterns to target traffickers,
- improved algorithms for computer-based systems to disrupt money laundering operations,
- multi-level database access tools for finding current relevant information within a multitude of databases,
- wireless technology that supports the acquisition of data and timely retrieval of information in the field,
- integrated computer and network technologies that link drug treatment centers for evaluating drug control efforts in the areas of treatment and education, and
- applications of information technologies to improve the coordination of counterdrug operations.

Border Research and Technology Center

A Border Research and Technology Center has been established to serve as a focal point for evaluating specialized law enforcement technologies to increase our drug-related mission effectiveness along the Southwest border. This Center was established jointly by the Department of Justice, the Department of Treasury and Office of National Drug Control Policy.

Support is planned to multi-agency efforts for evaluating interoperability of communications systems along the southwest border.

3.6 Outreach Program

> Educate and mobilize leaders, teachers, law enforcement officials, parents, family and friends to ... reduce illegal drug use and its consequences in America[4]

CTAC plans to continue the outreach program. The outreach program encourages frequent technical interactions among world-class scientists, engineers, law enforcement personnel and demand reduction experts. These efforts concentrate on bringing the best minds in the world together to combat drug abuse and the crime it spawns.

In the outreach program, a relevant topic of current interest is the subject of a comprehensive,

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[4] Barry R. McCaffrey opening statement to the House Committee on Appropriations, Subcommittee on Treasury, Postal Service and General Government, April 17, 1996

international technical review. The results of the review are presented at a symposium with the individual technical papers compiled and widely distributed in a proceedings report. CTAC has sponsored or co-hosted similar symposia for cargo inspection, tactical technologies and wide area surveillance in prior years. The next international counterdrug technology symposium is planned for July 1997.

Each year CTAC supports ONDCP regional conferences where broad-based interactive discussions on drug abuse prevention, treatment and counterdrug law enforcement technology are taken to the experts in the field. CTAC also participates in a wide variety of activities with technical and professional associations, such as the Armed Forces Communications and Electronics Association and the International Association of Chiefs of Police. Each of these endeavors targets specific audiences for participation in the counterdrug R&D program, either as providers or as users of advancements in technology.

4. PROGRAM ISSUES

Many of the Federal counterdrug law enforcement agencies, as a consequence of diminishing fiscal resources, have come to rely on CTAC to develop some of the core technologies for use in the mid to long term. CTAC's role allows them to apply more immediate resources toward operations and near term needs.

CTAC supports ONDCP in the annual budget review process by identifying and removing any R&D efforts that may be duplicative across individual agency programs.

Projected Requirements for FY 1998 CTAC Funding

The motivation to establish CTAC with its own budget stemmed from an understanding by Congress that law enforcement agencies had serious shortfalls in funding counterdrug research and development. CTAC was established as the central organization to develop a comprehensive R&D program to overcome these shortfalls which were estimated to exceed $600 million. CTAC also was directed to prevent duplication of effort and assure that wherever possible R&D efforts provide capabilities that transcend the needs of any single Federal agency. The appendices to every CTAC Blueprint have contained listings of these shortfalls, or scientific and technological requirements, in priority order.

Counterdrug R&D funding has experienced a steady decline in support since its peak in 1991 of $130 million to its current 1997 level of $49 million. Of the 21 Federal agencies with counterdrug missions, Department of Defense and CTAC funding accounts for 90% of the total counterdrug R&D budget for 1997.

It is anticipated that a key finding from the CTAC program review will address the substantial shortfall in counterdrug R&D investment needed to keep pace with the rapidly advancing state-of-the art.

As part of the President's budget, ONDCP plans to develop a request for a FY 1998 CTAC R&D program which restores the level of funding to one-half the peak 1991 level. This budget request would address new items in the areas of nonintrusive cargo inspection, demand reduction and focused tactical technologies.

The FY 1998 program would consist of the following elements:

- projects for nonintrusive inspection operations along our borders and at ports-of-entry,
- projects to advance demand reduction technology for therapeutic drug research and advanced medical research equipment,
- infrastructure support projects to evaluate new generations of equipment for analyzing drug signatures and evaluating drug detection devices in realistic settings,
- projects to develop technologies for information management, communications, tracking, surveillance and field support for law enforcement,
- incremental funds to complete successful multi-year R&D projects, and
- R&D projects recommended by the Science and Technology Committee.

Those organizations chosen to perform these projects will be drawn from the Government laboratories, academic institutions, and private sector. CTAC has interagency agreements and broad agency announcements in place to support executing each element of the program.

APPENDIX A - APPLICABLE LEGISLATION

The following highlights from applicable legislation summarize Counterdrug Technology Assessment Center appropriations, functions, staff levels and roles.

A.1 P.L. 100-690 of November 18, 1988 - Anti-drug Abuse Act of 1988

"There is established in the Executive Office of the President the 'Office of National Drug Control Policy'."

"There shall be at the head of the Office of National Drug Control Policy a Director of National Drug Control Policy."

"Each Federal Government program manager, agency head, and department head with responsibilities under the National Drug Control Strategy shall transmit the drug control budget request of the program, agency, or department to the Director at the same time as such request is submitted to their superiors (and before submission to the Office of Management and Budget) in the preparation of the budget of the President submitted to the Congress under section 1105(a) of Title 31, United States Code."

"The Director shall--

(A) review each drug control budget request transmitted to the Director...;

(B) certify in writing as to the adequacy of such request to implement the objectives of the National Drug Control Strategy for the year for which the request is submitted; and

(C) notify the program manager, agency head, or department head, as applicable, regarding the Director's certification..."

"There is established in the Treasury of the United States the Special Forfeiture Fund which shall be available to the Director of the National Drug Control Policy without fiscal year limitation in such amounts as may be specified in appropriations acts."

"The President of the United States shall direct the Office of National Drug Control Policy, established in Title I of this Act, to develop a comprehensive plan for utilizing no fewer than eight existing facilities of the Department of Defense, the Department of Justice, the Department of Energy, National Security Agency, and the Central Intelligence Agency, to develop technologies for application to Federal law enforcement agency missions, and to provide research, development, technology, and evaluation support to the law enforcement agencies of the Federal Government."

A.2 P.L. 101-510 of November 5, 1990 Counter-Narcotics Technology Act of 1990

"There is established within the Office of National Drug Control Policy, the Counter-Drug Technology Assessment Center. The Center shall operate under the authority of the Director of National Drug Control Policy and shall serve as the central counter-drug enforcement research and development organization of the United States Government."

"There shall be at the head of the Center the Chief Scientist of Counter-Drug Technology. The Chief Scientist shall be appointed by the Director of National Drug Control Policy from among individuals qualified and distinguished in the area of science, engineering, or technology."

"The Director, acting through the Chief Scientist, shall (a) identify and define the short, medium, and long-term scientific and technological needs of federal, state, and local drug enforcement agencies, including advanced surveillance, tracking, and radar imaging; electronic support measures; communications; data fusion, advanced computer systems and artificial intelligence; and chemical, biological, radiological (including neutron, electron, and gravitation) and other means of detection; (b) in consultation with the National Institute on Drug Abuse, and through interagency agreements or grants, examine addiction and rehabilitation research and the application of technology to expanding the effectiveness or availability of drug treatment; (c)

make a priority ranking of such needs according to fiscal and technological feasibility, as part of a National Counter-Drug Enforcement Research and Development Strategy; (d) oversee and coordinate counter-drug technology initiatives with related activities of other federal, civilian, and military departments; and (e) under the general authority of the Director of National Drug Control Policy, submit requests to Congress for the reprogramming or transfer of funds appropriated for counter-drug enforcement research and development."

"The authority granted to the Director under this section shall not extend to the award of contracts, management of individual projects, or other operational activities."

"Beginning with the budget submitted to Congress for fiscal year 1992 pursuant to section 1105 of Title 31, United States Code, the President shall submit a separate and detailed request relating to those federal departments and agencies having responsibility for counter-drug enforcement research and development programs."

"Subject to subsections (d) and (e) of section 1502 of Title 21, the Chief Scientist shall select and appoint a staff of not more than ten employees with specialized experience in scientific, engineering and technical affairs."

"The Director of the Advanced Research Projects Agency shall, to the fullest extent possible, render assistance and support to the Office of National Drug Control Policy and its Director."

A.3 Conference Report to Accompany H.R. 4739 of October 23, 1990 - National Defense Authorization Act for Fiscal Year 1991

"The conferees note that technological advances have the potential to make a dramatic contribution to the national counterdrug effort, particularly with respect to the detection of illegal substances hidden in sealed containers. The conferees expect that the center will ensure that gaps do not develop in the development of technology and believe the focus must be on the development of technologies that have the potential for realistic application."

A.4 P.L. 102-141 of October 28, 1991 - Treasury, Postal Service and General Government Appropriations Act, 1992

"For activities authorized by Public Law 100-690, to be derived from deposits in the Special Forfeiture Fund,$20,000,000 shall be transferred to the Counter-Drug Technology Assessment Center of the Office of National Drug Control Policy for counter narcotics research and development activities and for substance abuse addiction and rehabilitation research to remain available until expended."

A.5 Conference Report to Accompany H.R. 2622 of October 2, 1991 - Making Appropriations for the Treasury Department, the U.S. Postal Service, the Executive Office of the President, and Certain Independent Agencies, for the Fiscal Year Ending September 30, 1992, and for Other Purposes

"The conferees believe that in examining addiction and rehabilitation research, it is especially important to stress an interdisciplinary approach examining clinical, pharmacological and behavioral approaches to this problem. The conferees encourage the Counter-Drug Technology Assessment Center to work closely with the National Institute of Drug Abuse (NIDA) and the Addiction Research Center of NIDA in awarding grants in this regard."

"The conferees expect counter-drug enforcement research and development programs to be coordinated by the Center in order to prevent duplication of effort and to assure that whenever possible, those efforts provide capabilities that transcend the needs of any single federal agency. The conferees also expect the Center to give priority consideration to the application of existing technologies developed by the national laboratories and other federal research and development facilities to the research, development, and technological needs of drug enforcement agencies. In addition, the conferees direct the Center to use the funding provided to supplement individual drug control agency research budgets, thereby providing a source from which priority unfunded needs can be met."

"Prior to the obligation of these funds, the conferees expect to be notified by the chief scientist on how these funds will be spent. The conferees also expect to receive periodic reports from the chief scientist on those priority research and development requirements identified by the Center."

A.6 P.L. 102-393 of October 6, 1992 - Treasury, Postal Service, and General Government Appropriations Act of 1993

"For necessary expenses of the Office of National Drug Control Policy; for research activities pursuant to Title I of Public Law 100-690; ... of which no less than $900,000 and five full-time equivalent positions shall be made available for the Counter-Drug Technology Assessment Center; ..."

"For activities authorized by Public Law 100-690, ... of which $15,000,000, to remain available until expended, shall be transferred to the Counter-Drug Technology Assessment Center for counternarcotics research and development projects and shall be available for transfer to other Federal agencies and departments; ..."

A.7 Conference Report to Accompany H.R. 5488 - Treasury, Postal Service, and General Government Appropriations Act of 1993

"The Committee is pleased with the plan prepared by the Office of National Drug Control Policy (ONDCP) and its Counterdrug Technology Assessment Center (CTAC), to solicit innovative research and development projects in the areas of drug enforcement and demand reduction technology.

A.8 P.L. 103-123 of October 28, 1993 - Treasury, Postal Service, and General Government Appropriations Act of 1994

"For activities authorized by Public Law 100-690; ... of which $7,500,000, to remain available until expended, shall be available to the Counter-Drug Technology Assessment Center for counternarcotics research and development projects and shall be available for transfer to other Federal departments or agencies."

A.9 P.L. 103-329 of September 30, 1994 - Treasury, Postal Service, and General Government Appropriations Act of 1995

"For necessary expenses of the Office of National Drug Control Policy; for research activities pursuant to Title I of Public Law 100-690; ... of which $3,100,000 shall be available for ballistics technologies; ... of which $8,000,000, to remain available until expended, shall be transferred to the Counter-Drug Technology Assessment Center for counternarcotics research and development projects and shall be available for transfer to other Federal departments or agencies."

A.10 House Committee Report 103-534 to Accompany H.R. 4539 - Treasury, Postal Service, and General Government Appropriations Bill, 1995

"The conferees have provided $8,000,000 for research and development activities of CTAC in fiscal year 1995. Of this amount, $500,000 is provided for a nonintrusive inspection system assessment and engineering tradeoff study."

A.11 Conference Report to Accompany H.R. 4539 - Treasury, Postal Service, and General Government Appropriations Act of 1995

"The Anti-Drug Abuse Act of 1988, Public Law 100-690, was amended during 1990 to provide for the establishment of a Counter-Drug Technology Assessment Center within the Office of National Drug Control Policy. This office is authorized to serve as the central counternarcotics enforcement research and development organization of the U.S Government. The law provides for the appointment of a chief scientist ... to make a priority ranking of scientific needs according to fiscal and technological feasibility as part of the national counterdrug enforcement research and development strategy."

"The committee expects multiagency research and development programs to be coordinated... through the Counter-Drug Technology Assessment Center in order to prevent duplication of effort and to assure that whenever possible, those efforts provide capabilities that transcend the need of any single Federal agency."

"The committee believes that CTAC should work closely and cooperatively with the individual law enforcement agencies in the definition of a national research and development program which addresses agency requirements with respect to timeliness, operational utility, and consistency with agency budget plans. CTAC should develop a true blueprint for the program to include identification and assignment of priority projects, expected results, and funding projections .... This effort should be led by CTAC with input, review and consensus from the agencies. The national blueprint shall also include a rationale for allocation of funding among demand, supply, and State and local efforts."

A.12 P.L. 104-52 of November 19, 1995 - Treasury, Postal Service, and General Government Appropriations Act of 1996

"For necessary expenses of the Office of National Drug Control Policy; for research activities pursuant to Title I of Public Law 100-690; ... of which $16,000,000, to remain available until expended, shall be available to the Counter-Drug Technology Assessment Center for counternarcotics research and development projects and shall be available for transfer to other Federal departments or agencies; and of the funds made available to the Counter-Drug Technology Assessment Center, $600,000 shall be transferred to the Drug Enforcement Administration for the El Paso Intelligence Center."

Appendix B - COUNTERDRUG R&D PROJECTS FOR FY94 AND FY95

This appendix provides a listing of those projects comprising the national counterdrug R&D program for Fiscal Years 1994 and 1995. The listing is organized according to the agency that is acting as the "lead" for monitoring and reporting on the technical and fiscal aspects of the project. In most cases, CTAC and DoD use law enforcement agencies to oversee projects so the funding amounts in the listing include amounts funded by CTAC and DoD, in addition to individual agency funds. The totals are representative since these funds may not have been authorized, released or committed at the time of this document's release. Sensitive and intelligence related R&D projects or their funding are not shown in this appendix. An online database Counterdrug Technology Information Network will contain this information in the future.

Thrust	Tech	Lead	Title	Funding
Drug Enforcement Administration (DEA)				
WAS	SUR	DEA	Project Breakthrough	CTAC
TT	Insp	DEA	Drug Evidence Destruction Technology	CTAC
TT	SUR	DEA	Enhanced Real-time Voice Identification System	CTAC
TT	SUR	DEA	Cocaine & Heroin Impurity Testing	CTAC
TT	ADP	DEA	Automated Booking Station	DEA

	FY 94 ($K)	*FY 95 ($K)*
Total DEA	**726**	**1250**

Thrust	Tech	Lead	Title	Funding
Department of Defense (DoD)				
WAS	SUR	DoD	Passive Radio Frequency Tag	DoD
WAS	SUR	DoD	Commercial OTH Testbed (WARF)	DoD
TT	ADP	DoD	Counterdrug Simulation	DoD
TT	ADP	DoD	Analysis of Digital Computer Media	DoD
TT	ADP	DoD	Bank Security Act Database	DoD
TT	SUR	DoD	Low Cost Uncooled Sensor Project (LOCUSP)	DoD
TT	ADP	DoD	Text and Message Understanding	DoD
TT	ADP	DoD	Face in the Crowd	DoD
TT	ESM	DoD	Automated Fax Processing	DoD
TT	SUR	DoD	Vehicle Stopper	DoD
TT	SUR	DoD	Micro GPS	DoD
TT	SUR	DoD	Modular Tags	DoD
TT	COM	DoD	Personal Command System	DoD
TT	SUR	DoD	Tunnel Detection	DoD
TT	COM	DoD	Tracking and Phone System (TraPS)	DoD
TT	SUR	DoD	Tracking & Location Sys/FESTIVE/SLICE	DoD
NII	Insp	DoD	PFNA-TOF	DoD
NII	Insp	DoD	SW Border Testbed	DoD
NII	Insp	DoD	Vapor Generator	DoD
NII	Insp	DoD	Testbed Facilities and Phenomenology	DoD
NII	Insp	DoD	Small Package Inspection System	DoD
NII	Insp	DoD	Quick Screen/NOR	DoD
NII	Insp	DoD	Gamma-Gamma Resonance Imaging	DoD
NII	Insp	DoD	Microsensor, Surface Acoustic Wave Heroin	DoD
NII	Insp	DoD	Neutron Pulsed Source (2.5 MeV)	DoD
NII	Insp	DoD	Nuclear Quadrupole Resonance (NQR)	DoD

Thrust	Tech	Lead	Title	Funding
Department of Defense (DoD) (Continued)				
NII	Insp	DoD	Thermal Neutron Activation (TNA)	DoD
NII	Insp	DoD	Chemical Micro Sensor / SAW	DoD
NII	Insp	DoD	Chemical Detector/Neural Net	DoD
NII	Insp	DoD	Enhanced Canines	DoD
NII	Insp	DoD	Acoustic Imaging	DoD
NII	ADP	DoD	Cocaine and Heroin Database	DoD
NII	Insp	DoD	Cocaine Chemistry	DoD
NII	Insp	DoD	Fiber-Optic Chemical Sensor	DoD
DR	Treat	DoD	Demand Reduction	DoD
				FY 94 ($K) *FY 95 ($K)*
			Total DoD	**21,902** **25,766**
Federal Bureau of Investigation (FBI)				
TT	Insp	FBI	Advanced Forensic Development Program (Rsch Grants)	CTAC
TT	ESM	FBI	Top Water	CTAC
TT	ESM	FBI	Concealed Audio Transceiver Surv System	CTAC
TT	SUR	FBI	Location and Tracking System	CTAC
TT	SUR	FBI	LPI-LPD Body worn Transmitter	CTAC
TT	SUR	FBI	Topographic Maps with Buildings	CTAC
TT	SUR	FBI	Small Look	CTAC
TT	SUR	FBI	3-D Map Vector Presentation	CTAC
TT	SUR	FBI	Airborne System for Info Command and Control	CTAC
TT	ADP	FBI	DRUGFIRE Matching Algorithm	CTAC
TT	ADP	FBI	Law Enforcement Intelligence Network	CTAC
TT	ESM	FBI	Digital Telephony (ISDN Intercept)	FBI
TT	ESM	FBI	Rapid Prototyping Facility	FBI
TT	ESM	FBI	Improved Speaker/Topic Spotting Signal Proc	FBI
TT	ADP	FBI	Money Laundering Technology	CTAC
TT	ADP	FBI	Organized Crime and Drug Trafficking - GLADYS	CTAC
TT	COM	FBI	Southwest Border Communications	CTAC
TT	COM	FBI	Tactical Communications System	FBI
TT	COM	FBI	Consolidated Central Monitoring Facility	FBI
TT	ADP	FBI	Data Fusion (Information Sharing)	FBI
TT	ESM	FBI	Digital Plant Recorder	FBI
TT	ESM	FBI	Rebar Clutter HRT/SWAT	FBI
TT	SUR	FBI	Mobile Tracking and Surveillance Workstation	CTAC
				FY 94 ($K) *FY 95 ($K)*
			Total FBI	**8,966** **11,085**
Immigration and Naturalization Service (INS)				
WAS	SUR	INS	Transportable Observation Platform	CTAC
WAS	SUR	INS	Facial Recognition	CTAC
TT	ESM	INS	Ultra-Wide Band Compression	CTAC
				FY 94 ($K) *FY 95 ($K)*
			Total INS	**121** **250**

Thrust	Tech	Lead	Title	Funding
CTAC Demand Reduction Technology				
DR	Treat	HHS	Drug Abuse Brain Scanning Research	CTAC
DR	Treat	HHS	Cocaine Catalytic Antibodies	CTAC
DR	Treat	HHS	Drug Evaluation Network System	CTAC
DR	Treat	HHS	Analysis of Hair, Sweat & Saliva	CTAC
DR	Treat	HHS	Surface-Enhanced Raman Spectrometer	CTAC
			Total CTAC Demand Reduction	*FY 94 ($K)* 1,750 *FY 95 ($K)* 1,060
U.S. Coast Guard (USCG)				
WAS	SUR	USCG	Sensor Integration and Displays	USCG
WAS	SUR	USCG	Inverse Synthetic Aperture Radar Shipboard	USCG
WAS	SUR	USCG	Shipboard Infrared Imaging System (SIRIS)	USCG
TT	SUR	USCG	Video Communications (VICOM) Helmet	CTAC
TT	SUR	USCG	Forensics and Protocols Research	USCG
NII	Insp	USCG	Portable Drug Detector	CTAC
NII	Insp	USCG	Drug Detection Using Chemiluminescence	USCG
NII	Insp	USCG	Ion Mobility Spectrometry Detection	USCG
NII	Insp	USCG	Sensor Technology Research	USCG
NII	Insp	USCG	Phenomenology Research	USCG
			Total U.S. Coast Guard	*FY 94 ($K)* 885 *FY 95 ($K)* 1,367
U.S. Customs Service (USCS)				
WAS	SUR	USCS	ASARS-1A	USCS
WAS	SUR	USCS	Customs Airborne Stabilized Optical System (CASOS)	USCS
WAS	SUR	USCS	Handheld IR Imaging	USCS
WAS	SUR	USCS	P-3 AEW Tag	ARPA
WAS	SUR	USCS	P-3 Slick Weather Radar	USCS
WAS	SUR	USCS	P-3A Blue Star	USCS
WAS	SUR	USCS	UAV Demonstration	NGB
WAS	SUR	USCS	Video Surveillance System	USCS
TT	COM	USCS	Ballistic Radio Helmet	USCS
TT	SUR	USCS	Mini Acquisition Direction Finding Collection/Processing	USCS
TT	COM	USCS	Generic Dialed Number Recorder	USCS
TT	SUR	USCS	IR/NIR Paint Development	USCS
TT	ADP	USCS	Marine Vessel Architecture Database	USCS
TT	ADP	USCS	Metallic Materials Identifier	USCS
TT	COM	USCS	Newcomb Communications Satellite Tag	USCS
TT	SUR	USCS	Non RF Taggants	USCS
TT	COM	USCS	Palmtop Pager System	USCS
TT	ADP	USCS	Portable Document Capture System	USCS
TT	ADP	USCS	Portable TECS Terminal	USCS
TT	SUR	USCS	Rampart Redesign	USCS

Thrust	Tech	Lead	Title	Funding
U.S. Customs Service (USCS) (Continued)				
TT	SUR	USCS	Towed Sonar System	USCS
TT	ADP	USCS	Forensic Video Image Processing	USCS
NII	Insp	USCS	Advanced Dual Energy X-Ray	USCS
NII	Insp	USCS	Automatic Vehicle ID System	USCS
NII	Insp	USCS	Axle Weight Differential System	USCS
NII	Insp	USCS	Barringer Ionscan 400 IMS T&E	USCS
NII	Insp	USCS	Commercial Vehicle X-Ray System	USCS
NII	Insp	USCS	Gamma-Ray Detector for Tanker Trucks	CTAC
NII	Insp	USCS	Imaging Gamma-Ray Detector	CTAC
NII	Insp	USCS	Inspection Technology	CTAC
NII	Insp	USCS	ITI Instruments IMS T&E	USCS
NII	Insp	USCS	Machine Vision	USCS
NII	Insp	USCS	Magnetic Resonance Portal	USCS
NII	Insp	USCS	Miniature Intrusion Detection System	USCS
NII	Insp	USCS	Nuclear Quadrupole Resonance (NQR) - Drug Detection	CTAC
NII	Insp	USCS	Optical Card System	USCS
NII	Insp	USCS	Potassium Detector Demonstration	USCS
NII	Insp	USCS	Pulsed Fast Neutron Analysis (PFNA) Cargo Inspection	ARPA
NII	Insp	USCS	Rigid Borescope	USCS
NII	Insp	USCS	Ultasound Examination	USCS
NII	Insp	USCS	Low Radiation Source Mini-Buster	CTAC
NII	Insp	USCS	Gas Chromotograph / IMS	CTAC
NII	Insp	USCS	Narcotics Detection in Mail Packages	CTAC
NII	Insp	USCS	Miniature Gamma Ray Backscatter	CTAC
NII	Insp	USCS	Narcotics Detection Technology Assessment	CTAC
NII	Insp	USCS	Evaluation of Nonintrusive Inspection Tech (NII Study)	CTAC
NII	Insp	USCS	CTEC POE BETA Test Site	USCS
NII	Insp	USCS	Cargo Search Dual X-Ray Inspection System	USCS

	FY 94 ($K)	*FY 95 ($K)*
Total U.S. Customs Service	**20,229**	**7,817**

U.S. Department of Agriculture (USDA)				
TT	Insp	USDA	Crop Eradication	USDA
TT	Insp	USDA	Growth Research - Narcotic Crops	USDA
TT	Insp	USDA	Narcotic Chemistry - Biosensors	USDA
TT	Insp	USDA	Spectral Research - Poppy, Cannabis, Cocaine	USDA
TT	Insp	USDA	Rural Drug Abuse	USDA

	FY 94 ($K)	*FY 95 ($K)*
Total Dept. of Agriculture	**5,589**	**5,315**

Thrust	Tech	Lead	Title	Funding	
Central Intelligence Agency (CIA)					
NII	Insp	CIA	CTEC Instrumentation	CTAC	
				FY 94 ($K)	*FY 95 ($K)*
			Total CIA	0	0
				FY 94 ($K)	*FY 95 ($K)*
			TOTAL COUNTERDRUG R&D	60,168*	53,910*

**** Totals do not include funding amounts for intelligence related R&D projects***

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Abbreviation Key:

Defense Advanced Research Projects Agency (DARPA)
Central Intelligence Agency (CIA)
U.S. Customs Service (USCS)
U.S. Coast Guard (USCG)
Department of Defense (DoD)
U.S. Department of Agriculture (USDA)
U.S. Department of Health and Human Services (HHS)
Drug Enforcement Administration (DEA)
Federal Bureau of Investigation (FBI)
Financial Crimes Enforcement Network (FinCEN)
Immigration and Naturalization Service (INS)
U.S. Marshals Service (USMS)
National Guard Bureau (NGB)
U.S. Secret Service (USSS)
Counterdrug Technology Assessment Center (CTAC)
Thrust
- Wide Area Surveillance (WAS)
- Tactical Technology (TT)
- Nonintrusive Inspection (NII)
- Demand Reduction (DR)

Technology (Tech)
- Automated Data Processing (ADP)
- Communications (COM)
- Electronic Suppression Measures (ESM)
- Inspection (Insp)
- Tracking and Surveillance / Radar (SUR)
- Substance Abuse Treatment (Treat)

Lead - Agency providing oversight and reporting functions
Funding - Agency providing funding for project

APPENDIX C - DOD COUNTERDRUG R&D PROJECTS

This appendix provides brief descriptions of current or recently completed counterdrug R&D projects sponsored by the Department of Defense (DoD). The projects are listed according to applicable technology thrust or infrastructure support category. Where appropriate, the principal end-user organizations have been identified for those projects nearing completion.

DoD COUNTERDRUG RESEARCH AND DEVELOPMENT PROJECTS

This section provides descriptions of current or recently completed counterdrug technology development projects sponsored by the Department of Defense (DoD). The project descriptions are categorized by technology thrusts of Nonintrusive Inspection (NII), Tactical Operations Support (TOS), Wide Area Surveillance (WAS), and Demand Reduction (DR). The overall goal is to develop prototype systems, demonstrate their technical and operational capabilities, and transition them to user agencies. These projects are managed by he DoD Counterdrug Technology Program Development Office, now located at the Naval Surface Warfare Center, Dahlgren, Virginia

NONINTRUSIVE INSPECTION (NII)

The NII developments will provide a means to rapidly and effectively inspect vehicles, luggage, and cargo containers without impeding the flow of legitimate commerce. Unpacking and inspecting a large cargo container or truck requires approximately 20 man-hours of effort. Manual inspection of even a small percentage of the millions of vehicles and containers entering the country each year is not feasible. The NII systems under development use x-ray, neutron, and chemical detection technologies to rapidly inspect containers and determine the presence of illegal drugs or other contraband. Some of the DoD developed technologies have been transitioned to the United States Customs Service (USCS) and are currently being used at ports of entry.

An operational strategy is to deploy a family of mobile, transportable, non-intrusive systems in a system of systems to inspect cars, trucks, and tractor trailers. This inspection system will be capable of expeditious relocation between border crossing points in response to rapidly changing threats. Portable/ relocatable detection systems would be placed at the sites on a random basis, thereby creating a deterrent to drug smuggling in these locations. Technical performance evaluation of the particle and vapor detection systems will be performed by the Houston Area Research Center (HARC). Operational test and performance evaluation will be performed at the Thunder Mountain Evaluation Center (TMEC) at Ft. Huachuca, Arizona. Prototype non-intrusive inspection systems will be integrated into that testbed and evaluated jointly with the USCS. Those systems which are successfully evaluated at TMEC will perform stream of commerce testing, under the auspices of the U.S. Customs Service, at ports of entry.

Advanced X-ray Inspection System. This project provided for the development of an x-ray system using transmission and side/ back scatter imagery and installed in a testbed facility at the Otay Mesa, CA, border crossing station. The system is specifically designed to detect drugs and other contraband hidden within compartments, structural cavities, walls, and other areas in small vehicles and empty cargo trucks. The system uses two x-ray sources (450-KeV) to provide conventional transmission and low atomic weight side/ back scatter detection modes. When reviewing the x-ray images, trained analysts can detect an operationally significant quantity of drugs within areas of the conveyance not normally visible to the naked eye. The system is capable of non-intrusively inspecting up to ten tractor trailer rigs per hour at a sustained pace. The system was installed in July, 1994, coincident with the completion of the testbed and the new USCS border inspection station in Otay Mesa. Evaluations conducted jointly with USCS personnel have been highly successful. The system is currently operational, and has contributed to the detection and confiscation of considerable quantities of illegal drugs and other contraband

Mobile Detection Systems - X-ray. This project awarded multiple contracts for the development of a new generation of mobile non-intrusive inspection systems. A variety of x-ray technologies are being funded. These include a 450 KeV truck mounted highly portable system to inspect cars and trucks with both transmission and

backscatter x-rays, a high energy (2-8 MeV) shelter mounted transportable system to inspect cars and trucks, a medium energy (1 MeV) conveyer belt operated system to inspect aircraft size cargo containers, and image enhancement algorithms to automatically search the imagery and highlight suspected contraband for detailed examination by the operator. The systems developed shall be capable of quickly inspecting trucks, cars, and other vehicles for illegal drugs and other contraband. They shall be capable of being moved rapidly between different ports of entry sites in response to changes in the threat.

Pulsed Fast Neutron - Time of Flight (PFNA - TOF). A full-scale PFNA-TOF analysis system has been developed and is completing evaluation at the contractor's plant. The system uses 8.2 MeV pulsed neutron beams to scan and interact with the nuclei of atoms in the cargo. The nuclei excited from inelastic interactions with the neutrons emit target-unique energy level gamma rays, dependent on the object's elemental composition. The neutron delivery system defines the path of the neutron beam. The position of the object is further defined by measuring the time between the neutron pulse emission and detection of the gamma ray. To discriminate drugs, such as cocaine hydrochloride, from benign materials, the system looks for amounts of oxygen and carbon at the same location or volume elements (voxels) inside the container. The system allows automatic elemental imaging to detect operationally significant quantities of drugs concealed within the cargo or in hidden compartments inside the conveyance. Large cargo containers 8 feet high by 8 feet wide and 20-40 feet long can be inspected.

Quick Screen Nuclear Quadrupole Resonance (NQR). Quick Screen NQR is a small system to prescreen small containers and luggage for the presence of illegal drugs. The system is based on low-power radiation of the test container with a swept radio frequency that covers the resonant frequency of the drug chemical's atomic nucleus. The system quickly scans for a NQR response from chlorine in cocaine hydrochloride and a similar signal from heroin. The resonance is detected to trigger an alarm. This technique has been successfully demonstrated on small quantities of drugs, and a prototype system has been successfully demonstrated. An operational scenario could involve setting up the system in an area where baggage is moved on conveyer belts to aircraft loading areas. The conveyer belt would move through the detection system for non-intrusive screening. If alerted by a chemical signature, the container could be automatically marked or set aside for a visual inspection. This technology has been licensed by the government for commercial use by private industry.

Small Package Inspection System. A small x-ray system designed to inspect small packages, such as passenger luggage, air freight and mail, is being developed. The system could be installed in an airport location that would allow for high volume conveyer screening of passenger luggage, freight cargo, and mail without impacting commercial aircraft arrival and departure schedules.

Chemical Vapor and Particle Detection Systems

Chemical techniques include examination by mass spectrometry, ion mobility spectrometry, gas chromatography, optical spectroscopy, animal olfaction, and vapor and particle preconcentrators. These techniques specifically identify the substance in particulate quantities down to one nanogram or less. Chemical sensing devices have the advantage of small physical size, but the disadvantage that the container must be opened. They are used to detect cocaine residue or vapor emissions.

Mobile Detection Systems - Chemical. This project awarded multiple contracts for the development of a new generation of chemical detection inspection systems and subsystems. A variety of technologies is being funded. These include a field ion spectrometer based upon a Russian development; a high efficiency ion mass spectrometer; a chemical conversion technique that breaks down cocaine into methyl benzoate and heroin into acetic acid for easier detection; a collection preconcentrator that "puffs" on the drug sample by alternating heating and cooling ultra-thin wafers; a collection tube that has a porous wall injected with clean outside air to prevent the collected drug sample from sticking to the collection tube wall; and signal processing algorithms for ion mobility spectrometers and gas chromatographs.

Chemical Microsensor. A portable surface acoustic wave (SAW) microsensor for drug interdiction has been developed and successfully evaluated. The device is a hand-carried system to detect drug particles. The suspect particles, collected via a common "Dust Buster" in a

disposable filter, are pyrolyzed (heated) to decompose into chemical vapor by products. The SAW is covered by a thin selective coating that has an affinity for the target pyrolysis products. Upon a change in mass due to the target vapor absorption, a change in the SAW frequency propagation characteristics occurs which is sensed, processed, and used to trigger an alarm. The sensor has a wide variety of applications including screening cargo containers and searching ships by boarding parties. The entire system (collector, sensor, and processor) is battery powered, and weighs seven pounds.

Chemical Detector - Neural Net. This project is developing a handheld contraband detection instrument for large cargo container inspections using correlated gas chromatography. The gas chromatograph column elutes the collected sample into individual chemical components and detects the components by measuring changes in thermal conductivity as they exit the column. Neural nets analyze the detected signals to identify the vapor by-products of illegal drugs and discriminate against background substances. An inspector would use the system to collect and analyze vapors immediately upon opening a large cargo container. If alerted by a vapor signature, the container could be marked for unloading and visual inspection, or routed to another non-intrusive inspection device, such as an x-ray system, for further verification. The system will conduct a non-intrusive inspection of a large cargo container in approximately three minutes.

Enhanced Canine Substance Detection. Minimal scientific attention has been focused to fully evaluate the canine's biological and behavior mechanisms, sensory capabilities, and effectiveness with regards to sensitivity, selectivity, collection/transfer efficiency, and the inherent "going-to-source" operation. The primary objective of this project is to conduct analysis of the complex aspects that contribute to the effectiveness of substance detection canines and provide procedures and techniques to achieve validated reliability and improved detection capabilities and establishment of documented standards of reference/calibration. Canine olfactory absolute detection thresholds and specific odor(s) signature discrimination for various drugs will be determined in a scientifically valid and non-invasive manner using advanced psychophysical operant conditioning techniques. Output will address the impact of environmental and physical variables, test conditions and confounding factors, and the effects of health, age, nutrition, exposure to toxic fumes/materials, attractants/detractants, target vapor and/or particle concentrations, signature phenomenology, specialized sample target collection techniques, candidate selection criteria, and training concepts. The project is structured to optimize leverage of on-going multi-agency canine projects (DoD-Technical Support Working Group (TSWG), U.S. Secret Service, Federal Aviation Administration (FAA), the DoD Military Working Dog Program, U.S. Army (landmine detection), and the Defense Advanced Research Projects Agency (DARPA). Results will be provided to drug law enforcement agencies (DLEAs) to assist in the understanding and improving of our national canine assets. Furthermore, the results could augment the development of artificial biosensors for drug detection.

NII Support Activities

Supplementing the system development projects are a series of support activities. These include the Thunder Mountain Evaluation Center, test instrumentation, databases of drug physical and chemical characteristics, and simulation and modeling of the drug trafficking process including the effects of the introduction of interdiction systems on the flow.

Thunder Mountain Evaluation Center (TMEC). The purpose of TMEC, located at Fort Huachuca, Arizona, is to provide an operational test environment for NII systems prior to the introduction of the systems to operational DLEA's at ports of entry. The location provides facilities and personnel to support management, test, evaluation, technical analysis, operator training and logistic support for the systems. Indoor and outdoor test space, storage space for test cargoes and vehicles, and data reduction facilities are available. The facility was opened in September, 1995, and has already been used to evaluate a small package x-ray, a truck mounted portable x-ray, a gamma ray detector, and a hyperspectral infrared vapor detector. It is planned to perform a detailed technical performance evaluation of many of the vapor and particle inspection systems at HARC prior to the controlled operational testing at TMEC.

Particle/ Vapor Generator. This project is providing for a calibrated drug particle/ vapor generator for the constituents in cocaine and heroin (and their common salts). A reliable means to

accurately produce low concentrations of drug particles and vapor products (including degradation products and impurities) is needed to serve as a reference and standard for comparative evaluation of drug detection systems and canines.

Cocaine/ Heroin Chemistry. This is a study to characterize the chemical and physical properties of the constituents of cocaine and heroin (and their common salts). Specific objectives include head space analysis, effects of temperature and humidity (hydrolysis), and decomposition products of cocaine and heroin. A reasonable estimate of the chemical properties of illicit drug chemical emissions is required to optimize the development of drug detection systems.

Cocaine and Heroin Database. Existing databases of the chemical properties of illicit drug chemicals and their emissions are not detailed and often conflict. The illicit nature of these drugs promotes wide variances. This project will produce a single national database which can be utilized by drug law enforcement officer and technicians, detection system designers, and system evaluators. The first edition of a "Cocaine Handbook" has been distributed.

Generic Port Container Model. The Generic Port Container (GPC) model was developed through a joint program between the USCS and the DoD Counterdrug Program. The objective of the GPC model is to evaluate the effects of introducing advanced technology NII devices for detecting illicit drugs and other contraband at ports of entry. Variations of the GPC model simulate eight major commercial cargo facilities at ports of entry along the Southwest border (Brownsville, Hidalgo, Laredo, El Paso and Ysleta, TX; Nogales, AZ; and Calexico, and Otay Mesa, CA.) The model simulates the specific activities that take place at each of these locations, and allows analysts to assess the effects of inspection technologies and contemplated policy or operational changes on day-to-day activities of the port. The models show the impact of such changes on vehicle processing times, percentages of vehicles being inspected, volume of vehicles in the compound, and other parameters. Each model uses data from the specific port modeled. This data includes monthly, weekly, daily, and hourly volumes of vehicles by type of entry; times for loading and unloading vehicles for inspection; processing times; and staffing patterns. The model allows explicit representation of inspection technologies in terms of their probability of detecting drugs; probability of alerting when no drugs were present; and throughput (i.e., average time to process one inspection unit).

TACTICAL OPERATIONS SUPPORT

The purpose of the systems developed in this thrust area is to support field and headquarters activities of drug law enforcement agencies to disrupt the operations of drug trafficking organizations. Developments include a variety of surveillance, communications, navigation, data analysis systems.

Tracking and Phone System (TRaPS). This project has developed a covert tracking device composed of a miniaturized global positioning system (GPS) receiver, a cellular phone reporting link, and a laptop computer base station. The system positions data from the tracking device to be displayed on a computer screen map. GPS location is stored in non-volatile RAM with battery back-up in order to maintain the GPS almanac when power is disconnected. A motion sensor powers up the cellular phone when the target vehicle is in motion. Additionally, the tracking units are configured to receive input from an external microphone. A smaller miniaturized version is currently in development.

Facial Recognition. The facial recognition project consists of a large facial database, algorithm development for real-time recognition of specific individuals and a testbed (camera, detector, and face server). The testbed will simulate environments ranging from a crowded open concourse to single persons in police booking stations. The data base used for testing systems contains thousands of faces with varying resolution. A facial recognition system could be set up at passport checking areas in major air terminals. When intelligence indicates a wanted criminal might be passing through the terminal, the individual's face could be entered into the data base. The system would scan individuals as they had their passports checked to identify the wanted individual. The ability to detect and match target faces to a "mug shot" data base with high confidence has been successfully demonstrated.

Passive RF Tag. The passive RF tag is a small, low power transponder tag used with an APS-138/ 145 radars used on the P-3 and E-2C for overt/ covert long range tracking. The passive transponder tag is placed on suspected or known

drug trafficking aircraft. The tag signal generates a unique symbol on the radar display and allows the radar to quickly discriminate the tags from other radar targets. It has been successfully demonstrated with the USCS Airborne Early Warning (AEW) P-3 aircraft. This tag technology has been transitioned to the Defense Advanced Research Agency (DARPA) Small Unit Operations program for military applications with the JSTARS and ASARS radars.

Micro GPS. The micro GPS is a microminiature global positioning system (GPS) receiver using Multi-Chip-Module technology. The receiver is approximately 1.4x1.4x0.2 inches and consumes a maximum of 1.5 watts. The end product is embedded into other systems. The microminiature receiver would be used by DLEA agents and military personnel to improve the accuracy of location information received from tagging devices or while embedded covertly in other devices. The micro GPS system was transitioned to the U.S. Air Force Hook 112 Downed Pilot Rescue Radio and the Soldier 911 Project.

GPS/Clocks. A microminiature cesium cell atomic clock to be used by Global Positioning System (GPS) receivers is being developed. It is an accurate clock with a stability of one part in 10^{-12}. The clock will be used as part of a GPS tag to minimize the time the tag needs to reacquire the GPS signal after signal dropouts or receiver power turn off. Other applications range from expanded channel cellular radio synchronization to two-satellite GPS operation (with altimeter). The use of the clock module will enable a 10 fold reduction in tag electrical energy consumption in typical scenarios. Physical size will be approximately 25 cubic centimeters. This successful project has transitioned to the DARPA Small Units Operations Program.

Advanced FAX/ Data Signal Exploitation System. A system comprised of a computer work station, software, and peripherals to intercept, read, and process FAX/ and data communications has been developed. An agent could use the system during investigations with wire tap authorizations to conduct an automated intercept of communications. Intelligence analysts can use the system to collect foreign intelligence relating to drug trafficking operations. A prototype 12 channel system has successfully demonstrated.

Analysis of Digital Computer Media. This project provides the military and law enforcement communities, such as the Federal Bureau of Investigation's Computer Analysis Response Team (CART), with a workstation capability of performing forensic computer analysis on seized digital computer media. The approach is to build on the existing Automated Computer Exploitation System (ACES) which is optimized for MS DOS, and extend it capability to include Windows NT 3.5, Macintosh, and Unix. A broad area announcement (BAA) was issued to solicit developers of the workstations and software analysis and recognition modules. Development is currently underway.

Low Cost Uncooled Sensor Project (LOCUSP). The objective of the LOCUSP project is to develop an affordable long wavelength infrared imaging systems which does not require cryogenic cooling. This breakthrough technology greatly reduces the cost for civilian/ military applications. A complete engineering unit prototype has been developed with a sensitivity of 0.11 degrees C, that weighs 3 pounds, and uses only 5 watts of power. The device has been successfully demonstrated to many military and civilian organizations. The technology is now commercially available.

Tunnel Detection. A tunnel detection testbed has been established at Otay Mesa, Calif. The goal of the project is to create a mechanism for monitoring surface and subsurface border conditions for evidence of contraband activity in tunnels. Different geophysical technologies detection technologies were evaluated to determine their ability to detect tunnels such as those discovered at Douglas, Arizona and San Diego California. The surface and subsurface information regarding the soils and the man made features will be cataloged with a geographic information system (GIS).

Text and Message Understanding. This project is the application of artificial intelligence to message understanding and data analysis for use by defense and civilian agency intelligence missions. It can be used in a variety of scenarios including counterdrug. As part of the technology, a probabilistic language understanding model was developed to both learn data from examples and to control its search algorithm. The technology scans English language text and identifies the names of people and corporations. Databases are automatically populated as new data is identified.

Counterdrug Technology Information Network (CTIN). The CTIN project is an online database and bulletin board system dedicated to counterdrug technology and counterdrug activities. CTIN is unclassified, but access is controlled to registered CTIN users. Over thirty user agencies are currently registered. CTIN contains over 100 system descriptions and is designed to accept thousands more.

WIDE AREA SURVEILLANCE (WAS)

Wide area surveillance technologies provide surveillance of large geographic areas to detect air and maritime transit of illegal drugs within the Andean drug production countries or across transit areas such as the Caribbean Basin and Mexico; and also to detect drug manufacturing facilities such as clandestine laboratories in the jungles .

OTH Enhancements. Currently, a Relocatable Over-the-Horizon Radar (ROTHR) is operating in Virginia, with an area coverage over the Caribbean. The Virginia ROTHR was augmented by a second ROTHR site in Texas which provides complementary coverage of the Caribbean and portions of South America. A third ROTHR site is being planned for a location which can provide coverage in central South America. New technology can enhance these operational capabilities and DoD is investigating technology enhancements that can be applied directly to the ROTHR. Improvements are being developed in the following areas:

- Atmospheric noise reduction: Removing of the effects of impulsive noise events (lightning) from temporal data;

- Improved target resolution: Using an enhanced dynamic algorithm to improve weak target detection and tracking;

- Enhanced definition of land and sea interface: Enhancing of the land and sea interface would in turn improve the accuracy target location;

- Improved tracking of slow and maneuvering targets: Improving tracking algorithms in areas of Kalman filtering, track initiation, returns association, and peak detection;

- Coordinated registration enhancement (range error) by dynamic optimization (CREDO): Using CREDO to achieve ionospheric definition and true target range;

- Equatorial clutter reduction: Investigating methodologies to minimize the impact of equatorial spread doppler clutter that reduces OTH radar performance and creates range ambiguities;

- Imbedded communications: Using a portable system to receive an OTH radar waveform, modify it to carry data, and retransmit the signal in time synchronization with the next incoming OTH signal;

- Extended range coverage: Enhancing the current range capability of OTH radar to distances of 2000 to 2500 miles;

- Altitude readout: Developing algorithms and technology that will allow an accurate reading of the altitude of a tracked target;

- Beacon-Assisted Vectoring: Using repeater beacons at known locations to improve target location accuracy. Some of the technology enhancements have already been installed in the ROTHR.

Foliage Penetration Radar. A feasibility model foliage penetration (FOLPEN) radar was successfully demonstrated on a deHaviland DASH-7 aircraft in 1994. This radar was capable of detecting clandestine drug production laboratories deep in the jungle and covered by triple canopy forestation. Currently this project is integrating the FOLPEN radar with a hyperspectral infrared sensor and other electro optic/infrared sensors with a real time on board data processor and operator display.

Podded Radar. The Podded Radar project will modify an APS-144 ground surveillance MTI (moving target indictor) radar into an inexpensive air-to-air intercept radar. The radar will be integrated into an avionics pod which will be optimized for deployment on two A-37 attack jets. The A-37 aircraft were activated and re-generated from the USAF Davis-Monthan Air Force Base where obsolete, but usable aircraft are stored. A command and control concept is being formulated that will cue the APS-144 with data from the ROTHR. The aircraft and podded radars will be tested by the U.S. Southern Command during the spring of 1997.

Detection and Monitoring Study. This project is an in-depth analysis addressing all aspects of the detection and monitoring process for the counterdrug transit and source zones (i.e., Central and South America and the Caribbean). This analysis provides an assessment of air and maritime interdiction operations in the transit zone with particular emphasis on the improved surveillance potential of the U.S. Navy's Relocatable Over-the-Horizon Radar (ROTHR). The specific issues to be addressed include: (1) reviewing the air, land, and maritime cocaine transport modes and quantities shipped from the source countries to the US; (2) assessing the performance of detection and monitoring resources in time and space; (3) determining response times; (4) assessing employment tactics; (5) determining current operations of traffickers; (6) assessing potential countermeasures to interdiction; and (7) developing measures of effectiveness (MOEs) for detection and monitoring in the transit zone.

DEMAND REDUCTION

The Demand Reduction Project will examine ways for DoD to continue its aggressive testing programs in a more cost efficient manner. Currently, each Service has different procedures for this process with varying costs. Drug screening procedures will be examined to determine if a more uniform and efficient process can be developed. The Department has sponsored educational programs to discourage the use of drugs by military dependents, some of which included the civilian communities in the immediate vicinity of military installations.

Alternative Matrices for Drug Testing. This project is examining biological matrices such as hair, saliva, sweat and urine with the objective of determining the best matrix for monitoring drug use under various scenarios. Issues will be examined concerning application of each matrix for passive exposure, false identification of drug use and matrix bias among individuals. LSD analysis will be improved by extraction technology and improved confirmation chemistry. Alternative instrumentation and metabolites will be examined. One of the main objectives is to increase the detection window for LSD in human urine.

APPENDIX D - PRIORITY LISTING OF SHORT, MEDIUM AND LONG TERM SCIENTIFIC AND TECHNOLOGICAL NEEDS BY THRUST AREA

As required by the legislation which established the Counterdrug Technology Assessment Center, the counterdrug enforcement scientific and technological needs have been identified and placed into a priority order. This report provides a comprehensive updated listing of top priority scientific and technological needs according to short, medium, and long-term requirements in the supply-side reduction technology thrusts for Tactical Technologies, Nonintrusive Inspection, and Wide Area Surveillance.

TACTICAL TECHNOLOGIES

Priority Operational Needs

Ultra-miniature RF beacon

Unattended remote site video collection and data forwarding

Ultra-miniature radio

Real-time GPS-like tracking system

Transportable, wireless audio collection system

Portable capability to control/disable transport craft (cars, trucks, boats, planes)

Chemical coding/tags

Identify low detectable images with day/night camera (electronic infrared camera filter)

Small/Powerful Information Management System

Personnel safety and security system for counterdrug agents for world-wide coverage including personnel locator

High-speed software encryption

Remote monitoring of crowds and detection of suspect individuals

Capability to process voice and data intercepted from telecommunications networks

Identification using face, voice, fingerprint identification

Capability to automatically extract pertinent information from text

Alternative to traditional polygraph for "guilty knowledge" assessment

Track recording capability sufficient to reveal land/sea/air drug trafficking routes

Capability to standardize English representation of foreign language names, especially those typical of source countries.

Ability to retrieve and fuse information from heterogeneous databases, including text.

Identification of potentially suspicious activity and of aggregate patterns and trends from large databases, by linking together relevant information and by searching for similar (vice identical) information.

Short-Term S&T Requirements

Small, self-contained, quickly deployable, concealable video image collection and transmission system for remote use.

Inexpensive, noninterfering, electronic infrared video camera filter for use with a wide range of systems used by law enforcement agencies.

Nonaccess, covert, transportable audio collection system without wire connection between target and listening post.

Covert, pager-sized communications transceiver for undercover or surveillance use, which avoids detection by electronic and physical countermeasures.

A more accurate, less threatening alternative to traditional polygraph for the detection or corroboration of "guilty knowledge" of criminal investigative information or illicit activity.

Covert low power audio transmitter that can be worn during undercover operations that is not subject to detection by either commercially available frequency scanners, metal detectors or field effect sensors.

Low probability of detection and low probability of intercept transmitters and receivers that employ spread spectrum and other techniques to be used in place of the current generation of undercover audio surveillance transmission systems.

Low probability of detection and low probability of intercept video transmission system for use with current operational surveillance video transmission systems.

Improved interception capabilities for wireline and cellular telephone conversations and data transmissions.

Enhanced capability to intercept cellular phone communications and still meet wiretap warrant restrictions.

Portable system to monitor select audio signals in urban areas.

Ability to identify individuals through voice recognition.

Portable and mobile high resolution night vision devices that do not rely on bulky or noisy cooling systems.

Provide improved battery technology so that other covert systems can be further miniaturized.

Geographic information system capable of displaying location and identification information for officers and suspects in urban and rural environments.

Local tracking of target personnel, vehicles, containers, aircraft and watercraft at central location.
Short-range beacon detectable at several meters with local monitor.

Covert passive beacon for stand-off line-of-sight tracking of suspect vehicles or other contraband transporting conveyances.

ADP information access system that permits an individual with a particular security clearance to access various computer systems from a single work station and then filters system information to match the individual's security clearance.

Information Management System that associates financial transactions and analyzes the flow of those transactions to identify and correlate suspicious fund transfer activity.

Fixed system that automatically images suspects after they have been arrested and compares those images with criminal databases to assist in the rapid booking of those offenders. This will also identify outstanding warrants or related criminal activity.

Mobile system that will image people's faces, transmit those images to a central location and compare those images with a database to identify suspect traffickers and other dangerous criminals.

Capability to optically scan non-formatted data into a database and the ability to retrieve data through a text-based query system.

Software to automatically extract pertinent information from text.

Information Management System for matching suspected activities with addresses to target surveillance and apprehension.

A system which performs facial and voice recognitions via an automated digital auto-correlation algorithm.

A Pattern Recognition and Profile Development ADP system for targeting suspect traffickers as they pass through our international ports of entry.

Mobile device with capability to remotely monitor areas where crowds of people congregate and then alert the operator when suspect individuals are present in that crowd.

Provide low detectable images from hidden sensors.

A non-lethal capability to stop aircraft, vessels and vehicles which refuse to respond to law enforcement officials request to stop for inspection.

Mobile push-to-talk low probability of intercept communications.

Improved information processing capability to analyze voice and data intercepted over wireline or cellular communication networks.

A micro-miniature audio recorder to record and store conversations.

System for central control and management of frequency and crypto/privacy codes.

Continue development of psychological profile program which characterizes individual narcotraffickers.

A financial information management system that associates financial transactions and analyzes the flow of those transactions to identify and correlate suspicious fund transfer activity.

Biological, chemical, genetic controls for cannabis grown on public land in the U.S.

Environmental economic assessment of impacts of substitute crops compared to illicit cultivation and processing.

Illicit crop modeling to determine production/ yield potential.

New systems to safely and inexpensively destroy the vast amounts of seized illicit narcotics.

The ability to render inert and safe for disposal chemicals which are seized during drug raids.

An air deliverable coca plant eradication capability.

Airborne system for delivering crop eradication chemicals with the pinpoint accuracy for treating individual plants, small groups, or rows of plants.

Recommendations for substitute crops to replace the income lost due to the eradication of coca.

Software to automatically extract name (person or business), place, and role information from text.

Software to process error-full text which results from use and limitations of current OCR technology.

High performance data base systems which allow for aggregate queries on arbitrary criteria.

Medium-Term S&T Requirements

Low probability of detection and low probability of intercept transmitters and receivers that employ spread spectrum to be used in undercover audio surveillance transmission systems.

Low probability of detection and low probability of intercept video transmission system for use with current operational surveillance video transmission systems.

A personnel safety and security system for counterdrug agents for worldwide covert use.

High Frequency radio system enhancements to improve HF utility in the law enforcement environment.

Portable radio and navigation handset with world-wide geolocation and LPI radio communications.

Enhanced tactical radios including dual-band portable radios and multi-band mobile radios with multiple crypto capabilities.

Software to standardize English representation of names from multiple languages.
Software to automatically extract information from text and populate databases. Improvements to OCR technology to handle non- uniform document sizes, fonts, angles, etc.

Data analysis software which allows for discovery of non-linear relationships between data items (i.e., those not retrievable by statistical techniques).

Long-Term S&T Requirements

Video imaging systems that are smaller, more power efficient, and have greater resolution than those currently available.

Fixed, high-power microwaves or mechanical devices to stop cars that run through checkpoints to reduce number of high-speed chases.

Software to automatically extract information from text and create new database schema which captures previously unknown relationships.
Software to transliterate names from multiple languages into English.

OCR capable of handwritten material.

Software to automatically extract pertinent information from speech.

NONINTRUSIVE INSPECTION

Priority Operational Needs

Accurate signatures for detectable illicit drug emissions in operational environments for physical and chemical detection

Portable/transportable capability to detect and classify drugs, contraband and false compartments in vehicles and containers

Fixed capability to detect and classify drugs, contraband and false compartments in vehicles and containers.

Short-Term S&T Requirements

Develop Technologies for Large Container and Vehicle Inspections (1000 cubic feet).

Develop Technologies for Medium-Sized Container and Vehicle Inspection (50-1000 cubic feet).

Develop Technologies for Small Container Inspection (50 cubic feet).

Information Management System that merges law enforcement, industry, and public databases to improve the prescreening of manifest information of cargo containers for more detailed examination for concealed drugs.

Portable device to detect false compartments in containers, vehicles and vessels.

Portable device to detect drugs and other contraband hidden in tires, car doors, container walls, etc.

Fixed system to quickly pre-screen containers for the presence of cocaine and heroin by-products.

Capability to identify hull irregularities and detect hull appendages that are attached under the waterline of drug trafficking vessels.

Portable device to locate drugs hidden in the interior walls and cavities of containers, vessels and vehicles.

Fixed container inspection system to detect drugs transported in aircraft cargo and baggage containers.

Fixed container inspection system to detect drugs transported in SEA-LAND size containers.

Portable device to rapidly scan a suspect for swallowed drugs.

Fixed passenger and hand carried baggage inspections system to detect the presence of excess amounts of currency.

Medium-Term S&T Requirements

Develop a non-containerized or break bulk cargo inspection system that automatically detects density anomalies in non-containerized, homogeneous cargoes.

A walk-through drug detection system to rapidly screen passengers who may be carrying concealed narcotics.

Fixed system to detect drugs transported through the mail (all letter and parcel sizes).

Marine Architecture Database to display current production drawings of vessels commonly employed in drug smuggling to help identify voids and sealed spaces suitable for hiding contraband.

Increase the effectiveness of the U.S. Customs Service Automated Commercial System via incorporation of controlled cargo tracking and the expansion of databases.

Portable device to detect drugs dissolved in liquids and packaged in metallic containers larger than 50 gallon drums.

An expansion to the spectral data base for ion mobility spectrometers to include additional precursor chemicals.

Long-Term S&T Requirements

Expand capabilities for additional applications (Tariff Compliance).

WIDE AREA SURVEILLANCE

Priority Operational Needs

Facial Recognition

Target Sorting and Classification

Over-the-Horizon Detection and Targeting

Short-Term S&T Requirements

Improve the capability to correlate multiple sensor inputs into one presentation.

Automatic sorting and tracking (legitimate vs suspect targets).

Develop track recording capability sufficient to reveal patterns and changes to patterns and routes used by drug traffickers on land, sea and in the air. Integrate this capability with graphical information systems.

Automatic integration of all source databases.

Significantly improve the positional accuracy of OTH and ROTHR to 1-2 nm.

Develop an untethered UAV application with a multi-sensor package (> 1000 nm).

Satisfy airspace control concerns for UAVs.

Develop low cost, high bandwidth satellite communications.

Reduce the size and weight of RF and non-RF Tags.

Increase the durability, covertness, reliability and concealability with SATCOM and GPS capability.

Command and Control workstation that integrates surveillance, tracking, analysis and map image data, and includes communication interface with other computer information systems and voice communication networks.

A track recording device for aircraft, marine and land vehicles that will allow law enforcement agencies to determine and analyze current drug trafficking routes.

Beacon for tagging cargo containers or vessels with remote on/off activation via satellite control from a central monitor.

Miniaturized beacon with world-wide coverage which can be monitored from a regional command center.

Remote site monitor incorporating still video technology, high capacity digital storage and state of the art data transmission techniques for unattended use in hostile areas.

Portable semi-passive tag to attach to suspect aircraft for radar discrimination from nonsuspect aircraft.

Miniature active transponder with low probability of intercept equipped with remote monitoring at ranges up to 100 miles from a central location.

Develop a combined sensor and data transmitter to monitor and report activity at remote airfields.

Regional satellite communications and position location coverage for Central and South America.

Medium-Term S&T Requirements

Worldwide coverage for centralized monitoring of personnel, vehicles, containers, aircraft, watercraft, documents, currency and illegal drugs.

An automated vehicle tracking system capable of simultaneously tracking several hundred beacons.

Develop still video transmission capability for use with emerging digital mobile satellite systems.

World-wide satellite communications and position location coverage.

Long-Term S&T Requirements

Develop target altitude capability for OTH/ROTHR (within 5,000 feet)

APPENDIX E - CTAC TECHNOLOGY OUTREACH PROGRAM

This section provides a listing of those recent workshops and technical symposia sponsored by CTAC to formulate and implement the national counterdrug research and development program.

Workshops / Symposia

ONDCP/CTAC Regional Technology Workshop, April 23, 1996, Austin, Texas

PERF/CTAC Technology Seminar, March 14, 1996, St. Petersburg, Florida

ONDCP Regional Conference -- December 10-13, 1995, Miami, Florida

ONDCP Regional Conference -- November 12-15, 1995, San Francisco, California

Counterdrug Law Enforcement: Applied Technology for Improved Operational Effectiveness International Technology Symposium, Counterdrug Technology Assessment Center, Office of National Drug Control Policy, October 24-27, 1995, Nashua, New Hampshire

Drug Abuse Treatment Technology Workshop, Counterdrug Technology Assessment Center, Office of National Drug Control Policy, August 15-16, 1995, Baltimore, Maryland

APPENDIX F - ARTICLES AND PUBLICATIONS OF INTEREST

This section provides a listing of those recent publications applicable to CTAC's endeavors to formulate and implement the national counterdrug research and development program.

Publications

Development and Acquisition Plan for Border Port Inspection Technology, (Unclassified), United States Customs Service, April 1996

Benchmark Evaluation Studies of the Barringer Ionscan 400, Graseby Narcotec, Viking SpectraTrak 672, Ion Track Instruments Itemiser, and CPAD Ariel/PID Drug Detection Devices, Volume 2, Counterdrug Technology Assessment Center, Office of National Drug Control Policy, February 1996

Engineering Design Model for X-ray Imaging Inspection Systems (UNCLASSIFIED - LAW ENFORCEMENT SENSITIVE), (Draft) Technical Report to Office of Special Technology, Advanced Research Projects Agency, January 1996

X-ray Imaging Cargo Inspection Systems Trade Study (Draft), (For Official Use Only) Technical Report to the Office of Special Technology, Advanced Research Projects Agency, January 1996

Benchmark Evaluation Studies of the Illicit Substance Detector, AccuPress, Sentor 5000 and IonScan 350 Drug Detection Devices, (Unclassified), Counterdrug Technology Assessment Center, Office of National Drug Control Policy, November 1995

Counterdrug Law Enforcement: Applied Technology for Improved Operational Effectiveness International Technology Symposium (Unclassified), Counterdrug Technology Assessment Center, Office of National Drug Control Policy, October 24-27, 1995, Proceedings, 917 pages

A Counterdrug Research and Development Blueprint Update (UNCLASSIFIED), Counterdrug Technology Assessment Center, Office of National Drug Control Policy, April, 1995, 48 pages

Benchmark Evaluation Study of the Bulletproof and Drugfire Ballistic Imaging Systems (Unclassified), Counterdrug Technology Assessment Center, Office of National Drug Control Policy, November 1994

Test to Detect Contraband within Multiple Cargoes in Freight Containers at the Tacoma Nonintrusive Inspection Technology Testbed, (Unclassified), Advanced Research Projects Agency, November 30, 1994, Test Report, 52 pages

Thirteenth International Conference on the Application of Accelerators in Research and Industry, Presentation: "Risk Assessment for Real Time Detection Technologies" (Unclassified), November 7-10, 1994, Denton, TX

The Tagging, Tracking and Locating Research and Development Program Plan, (For Official Use Only) Advanced Research Projects Agency Maritime Systems Technology Office, October 1994

SPIE Conference - Nonintrusive Inspection Technology for Detecting Cocaine in Containers, Presentation: "National Perspective on Application of Technology to Cargo Inspection," (Unclassified) SPIE, July 25, 1994, San Diego, CA

Operation BREAKTHROUGH Coca Cultivation and Cocaine Base Production in Bolivia, Drug Intelligence Report (DEA-94032), Drug Enforcement Administration, Intelligence Division, July 1994, 19 pages

4th International Conference on Applications of Nuclear Techniques: Neutrons and Their Applications, Presentation: "Risk Assessment of technologies for detecting illicit drugs in containers" (Unclassified), SPIE, June 12-18, 1994, Crete, Greece

Tactical Technologies and Wide Area Surveillance International Symposium (Unclassified), U.S. Department of Energy, Argonne National Laboratory, November 2-5, 1993, Proceedings, 917 pages

A Counterdrug Research and Development Blueprint Update (UNCLASSIFIED), Counterdrug Technology Assessment Center, Office of National Drug Control Policy, October, 1993, 35 pages

Contraband and Cargo Inspection Technology International Symposium (UNCLASSIFIED), Office of National Drug Control Policy and National Institute of Justice, October 28-30, 1992, Proceedings 351 pages

A Counterdrug Enforcement Research and Development Blueprint (UNCLASSIFIED), Counterdrug Technology Assessment Center, Office of National Drug Control Policy, August 7, 1992, 33 pages

Law Enforcement Agency Technical Requirements for Review by the Federal Laboratories (FOUO), Science and Technology Committee, Office of National Drug Control Policy, February 5, 1990, 61 pages

Comprehensive Plan for Use of Existing Federal Research and Development Facilities for Civilian Law Enforcement (UNCLASSIFIED), Office of National Drug Control Policy, November 15, 1989, 51 pages

Articles

New Telephone Analysis System Developed for Drug Probes, The Drug Enforcement Report, January 23, 1996, p. 5

New Tracking System Developed to Improve Vehicle Surveillance, The Drug Enforcement Report, December 26, 1995, p. 3

Scientists Find Enzyme That May Ease Cocaine's Addictive Effects, The New York Times National, March 26, 1993

Researchers Develop Possible Treatment For Cocaine Addiction Using Antibody, The Wall Street Journal, March 26, 1993

Enzyme May Blunt Cocaine's Action, Science Magazine, Volume 259, March 26, 1993, page 1828

Antibody-Catalyzed Degradation of Cocaine, Science Magazine, Volume 259, March 26, 1993, page 1899-1901

How Politics Ruined Drug-War Planning, U.S. News & World Report, Volume 114, Number 7, February 22, 1993, page 29.

Tales From the Dark Side: Shedding New Light on Crime, Photonic Spectra Magazine, Special Staff Report,Volume 26, Issue 12, December 1992, pages 52-61

How Government Can Help: Military Technology Searches for Contraband Drugs, IEEE Spectrum Magazine, Volume 29, Number 12, December 1992, pages 46-52

Arcane Science Sparkles in Drug Enforcement War, Signal Magazine, AFCEA's International Journal, Volume 46, Number 12, August 1992, pages 21-27

APPENDIX G

UNITED STATES CUSTOMS SERVICE

DEVELOPMENT AND ACQUISITION PLAN FOR BORDER PORT INSPECTION TECHNOLOGY

April 1996

Prepared by:

The Applied Technology Division
Office of Information and Technology

Preface

The U.S. Customs Service is the world leader in the development and utilization of technology for the inspection of cargo, conveyances, persons, and mail. However, the last 2-3 years have seen fundamental changes in the way that Customs does its work, along with continued growth in Customs workloads and revenues, significant advances in technology capabilities, and increased support for the incorporation of new technology. The need and the opportunity for Customs to increase its investment in technology are apparent. At the same time, it is important that Customs plan and document its approach to the development and acquisition activities that comprise this investment.

This Report describes Customs rationale, strategy, current emphasis, and near-term plan for the development and acquisition of inspection technology for the border ports of entry, with emphasis on the drug detection technologies fundamental to narcotics interdiction. Individual plans for each technology project are maintained separately.

Inspection technologies for narcotics interdiction are only one facet of Customs increasing incorporation of technology into its basic strategies and processes. Customs plans for the development and acquisition of technology in support of its other strategies will be described in subsequent annual reports. These reports also will discuss Customs methods of measuring and comparing technology performance, and update the status of previous plans.

Comments on this Report may be addressed to the Director, Applied Technology Division, Office of Information and Technology, U.S. Customs Service, at (202) 927-1420.

U.S. CUSTOMS SERVICE
DEVELOPMENT AND ACQUISITION PLAN
FOR
BORDER PORT INSPECTION TECHNOLOGIES

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U.S. CUSTOMS SERVICE
DEVELOPMENT AND ACQUISITION PLAN
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As the Nation's principal border agency, the mission of the Customs Service is to ensure that all goods and persons entering and exiting the United States do so in compliance with all United States laws and regulations. This Report describes Customs strategy, current emphasis, and near-term plan for the development and acquisition of the technology used to inspect cargo, conveyances, and persons at border ports to support this mission.

CUSTOMS REQUIREMENTS FOR INSPECTION TECHNOLOGY

The operational and technical requirements for Customs inspection technologies are derived from Customs primary strategies and objectives, Customs operational philosophy, the model of the inspection process, and the criteria for technology performance.

Customs Strategies

Technology plays an important role in each of Customs primary operational strategies: narcotics, trade, passenger, money laundering, and outbound. The major focus of Customs current plans for technology development and acquisition are on the **narcotics strategy** and its **interdiction objective**:

> The goal of the Customs narcotics strategy is to prevent the smuggling of narcotics into the United States by creating an effective narcotics interdiction, intelligence, and investigation capability that disrupts and dismantles smuggling organizations.
>
> The objective for narcotics interdiction is to develop and introduce technologies and techniques to identify smuggled narcotics, to force smuggling organizations to change to higher risk smuggling methods, and to enlist the participation of other nations in efforts to disrupt the worldwide smuggling of narcotics.

Customs current plan for most of its inspection technology is based on two **narcotics interdiction sub-objectives**:

> Develop and implement more efficient, less intrusive technology and techniques to identify smuggled narcotics.
>
> Develop the electronic information systems to more effectively target high-risk cargo, conveyances, and persons at the ports of entry while expediting the flow of legitimate travel and trade.

Customs Operational Philosophy

Implementation of the Customs narcotics interdiction objective is guided by fundamental **beliefs and assumptions** predicated on our responsibilities, experience, and view of the future. Those most relevant to inspection technology are:

> Customs will continue the dual responsibilities of ensuring that goods and persons moving through the ports comply with U.S. laws and regulations while concurrently facilitating legitimate movement.

Customs will manage these responsibilities by making facilitation the product of effective law enforcement; i.e., effective enforcement systems will enable Customs to select the potential violator for intensive processing while expediting those who willingly comply with the law.

The Customs workload at border ports, currently about 437 million people, 10 million containers and trucks, 117 million private vehicles, 1 million aircraft and marine vessels, and the collection of $20 billion in tariffs, will continue to increase; but Customs total resources are likely to remain relatively static.

The smuggling threat is very dynamic; smugglers and smuggling organizations react quickly to enforcement measures in order to reduce the risk of discovery. As the border between the ports becomes more difficult to penetrate, drug smugglers will increase their efforts to use the ports; as the risks of discovery are raised for one means of penetrating the port, smugglers will seek other means, including previous methods if they appear viable again. At some level of enforcement, smuggling will be driven elsewhere, but this relocation is not necessarily permanent.

The effective and efficient screening and processing of low risk cargo, conveyances, and persons will allow Customs to focus the bulk of its anti-smuggling and trade enforcement resources on suspected and actual law violators, thereby increasing both the potential and the reality of detection.

The Inspection Process

The Customs inspection workload is distributed among 301 land, air, and sea ports of entry. These ports vary greatly in such characteristics as location, topography, economy, threat, and environment. To ensure a consistent basis for its activities at these diverse ports, Customs has developed a general model to organize the inspection procedures at each port.

An overview of this general model for the inspection of cargo, conveyances, and persons is shown in Table 1. Specific methods and resources to implement the model are determined by the nature of activity and other characteristics for each port.

Table 1
THE GENERAL INSPECTION MODEL

Pre-primary and Primary Screening

Conducted before and at time of arrival.

Involves examination of documents and identifiers and/or observation of appearance and behavior.

Utilizes intelligence systems and suspect data bases, passenger and merchandise processing systems, and external information systems and data bases.

Provides initial decision regarding release from Customs custody.

Table 1 (Con't)
THE GENERAL INSPECTION MODEL

Intensive and Non-intensive Inspection

Checks validity of decision made at primary or pre-primary screening.

Not limited to single location within the port; may be non-intrusive or intrusive.

Utilizes multiple sensors to detect either suspicious anomalies or specific contraband.

Determines or confirms the need for physical examination.

Physical Examination

Intrusive; requires partial to complete unloading, disassembly, or personal search.

Provides proof of illegal activity or non-compliance.

Exit Gate Review

Involves physical observation and/or document examination.

Confirms release from Customs area.

Criteria for Successful Technology Performance

Customs evaluates new technology that is proposed for development or acquisition against criteria that have proven to be significant in defining requirements and in determining the feasibility and eventual success of inspection technology. These criteria are listed in Table 2. The requisite values for each of these criteria are based on the specific operational application and environment being considered for the technology.

Table 2
CRITERIA FOR TECHNOLOGY EVALUATION

Safe for the user, public, and target.
Legal and proper in the intended use.
Fits in the Customs process and environment.
Reliable detection response; usable in court.
Appropriate selectivity and sensitivity.
High availability and maintainability.
Multi-purpose.
Cost-effective over life cycle.
Affordable.
User-friendly.
Improved utilization of inspection resources.

CUSTOMS STRATEGY FOR TECHNOLOGY DEVELOPMENT AND ACQUISITION

The Customs Service strategy for the development, acquisition, and deployment of inspection technology is based on both operational requirements and technological capabilities. Operational requirements include the smuggling threat and our perceived vulnerabilities (both current and projected), types and quantities of objects to be inspected, related screening and examination processes, and external constraints. Technological capabilities include the equipment's expected performance both in its primary role of detecting drugs and in any complementary applications such as detecting other contraband or measuring trade compliance; as well as its satisfaction of the evaluation criteria.

Our technology development and acquisition strategy is further influenced by the reality of our critical enforcement responsibilities, particularly with respect to drug smuggling. Drug smuggling is a real and immediate problem for this Nation, it is not a theoretical problem or one of the future. Customs choices regarding new technology also must recognize today's constraints on time and resources. Our philosophy for investment in the development of potentially suitable new technologies favors the approaches that present minimum risk of operational, cost, or schedule failure. Furthermore, if there is an available technology that responds to current and foreseeable requirements and priorities, and is both operationally and economically feasible, it is our obligation to put that technology into use as soon as possible.

The Customs Service believes strongly in new technology and is responsible for the development of the most successful drug detection technology in use today. We cannot afford to wait for the elusive perfect system that is always just over the horizon; we must acquire effective devices for today's most critical areas as soon as the technology is available and affordable. The always-better technology of the future can be considered later, if and when it becomes available, and if it is appropriate and needed for the critical priorities of that time. We also realize that many operational requirements are not satisfied by available technology, and that development must be pursued strenuously to meet these needs. When these efforts produce equipment that meets our criteria, Customs will add it to our arsenal; not because it is new or represents the state-of-the-art, but rather because it is necessary, effective, appropriate, and affordable.

This pragmatic approach to equipment development and acquisition is illustrated by our technology strategy for Operation HARD LINE on the Southwest border. We are procuring bollards, stop-sticks, and Jersey barriers to deal with the portrunner problem, while at the same time we pursue new truck X-ray systems and improved drug detection devices to deal with drugs concealed in conveyances and cargo. In short, we are using low-tech methods as well as high-tech, and we are as satisfied with adapting existing technology as we are with the acquisition of new technology; our single objective is to provide appropriate tools to assist the inspection process in as timely a manner as possible.

INSPECTION TECHNOLOGY CURRENTLY IN USE

Technology Currently Deployed

Customs uses a considerable variety of systems and devices to assist the inspection process. They are listed in Table 3 according to the element of the process in which they are most frequently employed, except for dogs, which are used in every stage of inspection.

Table 3
INSPECTION SYSTEMS AND DEVICES CURRENTLY IN USE

For Pre-primary and Primary Screening

Automated Intelligence Systems and Suspect Data Bases

Automated Commercial Systems

Automated Targeting Systems

Passport Readers

Dogs

For Intensive and Non-intensive Inspection

Gamma Backscatter Devices (Busters)

Truck, Mobile, Light Pallet, Baggage, and Mail X-rays

Range Finders

Fiberoptic Scopes

Drug Particle Detectors

Narcotic Detection Sprays

Dielectrometers

Biosensors

Radiation Sensors

Probes

For Physical Examination

Medical X-ray

Banned Substance Recovery Unit

Hand tools

The inspection technologies most widely-used for the detection of drugs and other contraband are listed in Table 4. This table provides the total number of units of each item that are deployed nationwide as well as the number currently on the Southwest border, their average cost, and the cumulative value of Customs investment in their procurement. Table 4 does not include equipment that is currently on order but not yet delivered, equipment that is planned for future procurement, or equipment that is loaned to the field for evaluation; it also does not include the costs of technology development and evaluation.

Table 4
DEPLOYMENT OF DRUG DETECTION EQUIPMENT
(As of January 1996)

Equipment Type	Tot. Qty.[1]	SWB [2] Qty.	Avg. Cost ($K)	Cum. Cost ($M)
Gamma Backscatter (Buster)	187	132	5.	0.9
Contraband Detection Kit [3]	54	33	12.	0.6
Fiberoptic Scope	35	35	9.	0.3
Laser Rangefinder	58	22	7.	0.4
IonScan Particle Detector	2	0	50.	0.1
Dielectrometer	32	25	8.	0.3
Biosensor	10	10	2.	0.02
Mail X-ray	16	0	106.	1.7
Baggage X-ray (Airport)	51	1	103.	5.3
Light Pallet X-ray	30	15	130.	3.9
Mobile X-ray Van	50	13	144.	7.2
Truck X-ray	1	1	3.3M[4]	
Totals	526	287		$20.7M

Notes:

1. Excludes equipment on order, planned, or on loan.

2. SWB denotes Southwest border land ports only.

3. The Contraband Detection Kit includes a Buster, Fiberoptic Scope, Sonic Rangefinder, Sprays, and Probes not included elsewhere in this table.

4. Cost is for development of prototype paid mostly by the Department of Defense, Advanced Research Projects Agency; not included in totals for Customs cumulative costs of system acquisition.

Technology Performance and Results

The testing of inspection technology under controlled conditions in the laboratory or in the field provides an indication of the performance to be expected under operational conditions, but the real measure of performance is what the technology accomplishes during sustained day-to-day use in the field. Unfortunately, this is not always easy to quantify.

For example, while we can count the detections made by a device, we cannot readily measure other factors affecting its performance such as the total number of detections that were possible, how a smuggler's attempt to foil one device may have contributed to its detection by another, the influence of the sequence in which devices were used, and the extent to which one device helped confirm a suspicion first raised by another. External factors making it difficult to measure the value of a device by the detections it makes are the wide range in drug values, the difficulty in measuring the value of smuggling deterrence or displacement resulting from the smuggler's fear of the device, and the likelihood that smugglers might adopt a new smuggling mode affecting the future utility of the device.

The greatest variable in the performance of any inspection device is the inspector who uses it; the inspector's attitude, instinct, and perseverance will markedly affect the performance of the device. For example, just a few years ago only a small number of inspectors used the Buster to check vehicles, most felt that it was not helpful. Fortunately, the eventual successes of these few inspectors finally were enough to convince the rest, and the Buster is now one of Customs most widely-used tools for vehicle inspection.

For today's inspection technology, the best measure of overall performance and value is the degree to which a device or system fits into the inspection process and is used by inspectors as a natural extension of their total capabilities.

Although a tally of the detections made by a particular type of technology has drawbacks as a measure of its value, there are no other quantifiable methods available at this time. Therefore, to develop such a tally for the purposes of this report, an analysis was made of contraband hits reported in the Treasury Enforcement Communications System (TECS) in which the use of a major type of inspection technology could be readily determined. The time period analyzed was September 1994 to January 1996.

Table 5 summarizes the results of this analysis; the technologies listed are general X-ray systems (mobile, pallet, baggage, and mail; excluding the medical X-ray), the Otay Mesa truck X-ray system, Busters, and fiberoptic scopes. As an estimate of the monetary value of these seizures, a further analysis was made of the quantities of drugs detected in the months of December 1995 and January 1996, and their estimated prices. The prices per kilo used for this analysis were: heroin, $130,000; cocaine, $18,500; opium, $13,000; hashish, $4,400; and marijuana, $2,900 per kilo. The resulting values of the drug seizures were $29.5M for December 1995 and $14.OM for January 1996. The considerable difference in estimated value between these 2 months is due to the larger amount of cocaine included in the December seizures.

Table 5
TECS HITS ATTRIBUTED TO DETECTION TECHNOLOGY
(Nationwide, September 1994 - January 1996)

MONTH	GENERAL X-RAY	TRUCK X-RAY	BUSTER	FIBER-SCOPE	TOTAL
1994					
September	93	2	9	2	106
October	110	4	14	8	136
November	115	6	26	6	153
December	99	4	20	0	123
1995					
January	80	2	21	4	107
February	87	3	24	6	120
March	57	4	23	4	88
April	59	4	41	1	105
May	71	7	28	3	109
June	44	11	32	10	97
July	56	2	16	5	79
August	50	6	17	4	77
September	53	9	13	5	80
October	50	2	10	5	67
November	51	5	27	0	83
December	64	5	23	3	95
1996					
January	54	7	19	2	82
Totals	1193	83	363	68	1707

Performance of the Truck X-ray System

The procurement of additional truck X-ray systems based on the Otay Mesa prototype is a key element of the Customs Southwest border strategy. A total of 12 systems, including the improved prototype, is currently planned for installation in the primary commercial import ports along this border. **Customs commitment to the acquisition of this system is based on 18 months of rigorous operational use that produced a strong belief by our operational personnel in the effectiveness of the system and a demonstrated record of its successful performance.**

Through March 1996, the X-ray system at Otay Mesa made 82 drug and other contraband detections including over 11,150 pounds of heroin, cocaine, marijuana, and amphetamines, and 19 people. Drug quantities detected have ranged from as much as 1,933 pounds to as little as 9.7 pounds. Contraband has been found in more than 20 different types of vehicles, including commercial and private trucks of all sizes, cars, recreational vehicles, towed boats, and a tar trailer; the contraband was hidden in vehicle doors and roofs, false walls, gas tanks, tires, passenger and engine compartments, and cargo areas. In many cases, inspectors sent suspect vehicles from other locations to the Otay Mesa X-ray for a more thorough and quicker non-destructive examination than they could perform at secondary. The system also was used to examine thousands of vehicles that were quickly released after inspectors were assured that they were not carrying drugs or other contraband.

Customs wanted this system to examine trucks returning empty to the U.S. for contraband concealed within the truck itself; i.e., in hidden compartments or within the structure of the truck. The system was designed for this purpose. Two X-ray sources located below ground level provide a unique upward-looking view from each side of the vehicle that focuses the main energy of the system on the truck undercarriage, ends, and sides; the areas frequently used for contraband concealments. The proprietary backscatter imaging capability helps to illuminate contraband hidden in the structure of the vehicle near the X-ray source - drugs, explosives, and other organic materials provide a bright white image on the backscatter displays. Our inspectors attribute about 60 percent of their drug detections to the backscatter image; the other 40 percent are attributed to the standard transmission image that also is provided by the system. Tests conducted by Battelle Laboratories before the Otay Mesa X-ray was turned over to Customs concluded that this system was "effective in locating contraband located near the external surfaces of empty trailers, including externally mounted tires." The list of drug detections to date indicates that the system is effective in locating drugs in many other types of vehicles and concealment areas as well.

As we gain experience with this system, we find that it also can detect contraband hidden within or among certain less dense types of the cargo encountered on the Southwest border, such as the 1,933 pound drug seizure found within a commercial shipment of wooden picture frames. Based on their evaluations to date, our inspectors believe that the truck X-ray system will detect drugs concealed in such cargo as television sets, pinatas, sawdust, electrical lamps and cable, wood furniture, plastic goods, bread, and ceramics. Not surprisingly, they also have found that the system does not effectively penetrate dense materials such as scrap iron, printed matter, and foodstuffs that are frozen or have a high moisture content. However, even when dense cargoes cannot be penetrated, the upward-looking X-ray beams still allow the inspectors to scan the highest-risk hiding places in the vehicle, thereby allowing them to focus any intrusive physical examination on the cargo itself rather than on the vehicle.

The truck X-ray system also is very appropriate from a safety and facility perspective. It utilizes X-ray sources rated at only 450 thousand electron volts (KeV), about 3 or 4 times the energy of a typical passenger X-ray system at an airport. Nineteen persons concealed in trucks have passed through the X-ray system without any physical harm, and foodstuffs also can be safely examined. There are no radiation hazards or safety measures for the Customs and National Guard personnel that operate the system or for truck drivers and bystanders. The system is small enough to fit within all but the most confined commercial ports on the Southwest border. In addition, operating expenses are low and training requirements are minimal. Customs inspectors with experience using the other backscatter X-ray systems operated by Customs have learned quickly to operate and utilize this new system and have been enthusiastic about its capabilities.

Customs considered several alternatives for the inspection of trucks and other vehicles on the Southwest border, including some systems with greater technical performance, before deciding to proceed with an X-ray system based on the Otay Mesa prototype. At an installed cost of about $3M each, the systems are indeed costly, but **we are convinced that the new truck X-ray system is the optimum combination of proven performance, affordability, practicality, and long-term value for the threat of drug smuggling in commercial vehicles and for the subsequent period of deterrence when this threat moves to another means of entry.**

INSPECTION TECHNOLOGY FOR THE FUTURE

Systems and Technology in Development

As the previous material indicates, Customs depends on a variety of information systems, detection devices, and other tools to support the inspector and the inspection process at any port. The Customs inspector and these tools constitute the complete inspection system. No single tool, and certainly no single type of technology, is expected to do it all.

Table 6

INSPECTION SYSTEMS/TECHNOLOGIES IN DEVELOPMENT OR EVALUATION

For Pre-primary and Primary Screening

Advanced Automated Targeting Systems
Improved Automated Intelligence Systems and Data Bases
Improved Automated Commercial Information Systems
Electronic Smart Cards and Chips
Facial Recognition and other Biometric Identification
Automated Inbound and Outbound License Plate Readers
Vehicle Weigh-in-motion Sensors
Radiation Detectors
Handheld TECS Terminals

For Intensive and Non-intensive Inspection

Vehicle, Container, Pallet, and Baggage X-ray Systems
Tanktruck and Tankcar Examination Systems
Container Examination by Pulsed Fast Neutron Analysis
Improved Drug Vapor and Particle Detectors
Drug and Explosive Detection by Nuclear Resonance
Biological Sensors to Detect Drugs and Bulk Currency
Hazardous Material Identification
Material Identification for Trade Compliance
Portable and Handheld TECS Terminals
Automated Port Simulation Models

For Physical Examination

Detection of Drug Swallowers by Biological and Nuclear Resonance Sensors
Full-body X-ray Systems

The principal inspection systems and technologies currently being developed and evaluated by Customs are listed in Table 6, again arranged by the element of the inspection process in which they would be utilized the most. The items listed are predominantly those being investigated solely by Customs or in coordination with another agency, as well as some of the commercial efforts that we are watching most closely at this time. The funding for these development and evaluation efforts is from the Department of Defense, the ONDCP Counterdrug Technology Assessment Center (CTAC), the Federal Aviation Administration, Customs, and other domestic and international sources. This list of current development and evaluation efforts is necessarily dynamic, subject to change as results are obtained from on-going efforts, as new high-promise technologies are identified by the research community, or as operational needs and priorities may change.

Most of the technologies included in Table 6 would be used by Customs to detect concealed drugs or to support other aspects of the narcotics interdiction strategy. Some have application to other Customs strategies, either exclusively or in addition to applications for narcotics interdiction. Examples of how new inspection technologies could support other strategies include screening cargo for compliance with trade regulations, identifying arriving persons that are on criminal lookout lists, detecting concealed currency, and examining outbound containers for stolen cars and other illegal shipments. Each of these technologies, if successful, will support Customs achievement of its operational goals. The narcotics interdiction technologies with the potential for the greatest impact within the next 2 to 3 years are highlighted in Table 6 and discussed further below. It should be noted that some information in these discussions regarding technology capabilities and future costs has been generalized to avoid disclosing sensitive or proprietary information.

High Potential New Technologies for Drug Detection

Technologies for the detection of concealed drugs and other contraband are of two types: those that detect an anomaly in external or internal appearance that typically indicates a concealment, although the exact material concealed may not be indicated; and those that detect a specific target substance based on its unique signature. An example of the first type is the X-ray, an example of the second type is a cocaine particle detector. Customs generally attempts to utilize both types in any inspection scenario to maximize the detection potential and make countermeasures more difficult.

Technologies for Pre-primary and Primary Screening are primarily of the first type at present. They consist of trained observers and automated systems looking for abnormalities in appearance, documentation, or other identifiers that signal a potential smuggler. The principal exception is the narcotics detector dog, which reacts only to a specific indication of the target drugs.

Advanced Automated Targeting Systems. Customs has for several years employed two types of prototype automated targeting systems at several major seaports to select and prioritize for inspection the shipments most likely to contain drugs or be guilty of commercial fraud. Both types are rule-based expert systems employing artificial intelligence techniques to assist the targeting efforts. These systems have been used successfully to target shipments of narcotics. Based on the success of these prototypes, Customs has initiated the development of an advanced Automated Targeting System (ATS) ultimately intended for the screening of importations at all major ports. Among the techniques to be incorporated in the ATS are: (1) a rule-based expert system; (2) neural networks to provide automated trend analysis capabilities; (3) importation profiling; (4) incorporation of Customs intelligence systems and suspect data bases; and (5) feedback mechanisms to support the evaluation of targeting effectiveness. A seaport ATS prototype is under evaluation; development of a prototype land-border ATS is being planned.

Technologies for Intensive and Non-intensive Inspection currently include both anomaly detectors and substance detectors. They can be used to complement each other, particularly against a wily smuggler. For example, attempts to defeat an anomaly detector by making the drugs look like an innocent object will not defeat the substance detector, and attempts at packaging drugs to defeat a substance detector could be recognized by the anomaly detector.

Vehicle X-ray. Customs has hands-on experience with two large-scale vehicle X-ray systems. The first is the AS&E prototype truck X-ray system at Otay Mesa, described above. The second is the high-energy system integrated by ASEC, Inc., for the ARPA non-intrusive inspection testbed at Tacoma, Washington. This system used horizontally and vertically mounted X-ray systems provided by Heimann Systems of Germany; it was tested at energy levels of 8 and 10 million electron volts (MeV) and had a throughput rate of 6 to 8 trucks per hour. It was very effective in the detection of simulated concealments in cargo or the conveyance based on an image analysis time of about 12 minutes, and was estimated to cost $12M to $15M as a complete system ready for operation. The high levels of X-ray energy required extensive shielding and personnel safety measures. Proposals by ASEC to reduce the cost and size of the facility generally involve eliminating the vertical X-ray beam and reducing the X-ray energy level; proposals for increasing the throughput rate require additional analyst work stations, truck transport systems, and operating personnel. Other proposals to reduce costs first require costly and presently unfunded R&D efforts aimed at lowering component costs and improving signal processing. There is no data on the effect that any of these changes would have on overall system performance.

Customs and DoD are evaluating an AS&E mobile X-ray system intended for vehicle examination. The truck-mounted system employs one 450 KeV source and provides backscatter images only. In operation, it would be driven slowly past a line of stopped and unoccupied vehicles. Initial tests indicate the system could be very effective in detecting bulk amounts of concealed drugs in passenger cars, other similar-sized vehicles, and empty trucks. The operational feasibility of examining large and/or heavily loaded trucks needs to be determined; they might require up to four passes by the mobile system past the truck. The system also may be useful for the examination of baggage and cargo igloos at airports but tests of this potential application are needed. The cost of a production system should be under $1.75M. The DoD also plans to develop a mobile vehicle-examination system with both transmission and backscatter capabilities.

DoD also is funding the development of a larger and more powerful vehicle-examination system built by AnnisTech, Inc. This system will operate in the 2 MeV range with both transmission and backscatter capabilities; it is 18 to 20 months from demonstration. The cost of a production system is expected to be in the $4M to $6M range.

Heimann's product line includes mobile vehicle X-ray systems with energy levels of 300 and 500 KeV; they provide both a horizontal and downward-looking vertical beam with transmission imaging. The 300 KeV system has a price of $1.5M. Another 140 KeV system with a single horizontal beam is offered by Heimann to determine whether a supposedly empty truck or container is really empty. This system costs about $500k. Operational data on the drug detection performance of these systems is not available.

Container X-ray Systems. The detection of drugs in seagoing or rail cargo containers will require X-ray energy levels in excess of 1 MeV. The ASEC/Heimann 8 to 10 MeV truck X-ray system described above would have excellent capabilities for detecting drugs in loaded cargo containers. The AnnisTech 2 MeV truck X-ray system also could be very effective against loaded containers, but there is no test data yet available for this system.

In response to Customs FY96 solicitation for a truck X-ray system, Heimann proposed an 8 MeV system that would have been suitable for containers, at a cost of approximately $15M. Systems recently installed in Germany, France, and China for truck and container examination may have

similar uses in the U.S., but the systems are too new for reliable operational data, and tests against our requirements have not been conducted. Costs of these systems are said to be between $5M and $20M, but these are speculative and without full description of the system to be provided.

Pallet X-ray Systems. Our current X-ray systems to examine palletized cargo can handle a pallet weighing up to 800 pounds, which is not sufficient for most truck and sea cargo. EG&G has developed a 350 KeV pallet X-ray system for DoD that will handle pallets weighing up to 2,000 pounds and about 4 foot square; Customs will evaluate this system for cargo applications later this year. AnnisTech is developing a higher-energy pallet X-ray system for DoD that should be capable of handling and penetrating pallets weighing up to 4,000 pounds and up to 6 feet high, including the LD-3 air cargo pallet. The first prototype should be available in about 9 months; additional units should cost under $1M.

Baggage X-ray Systems. These systems are used primarily at airports to examine selected baggage and parcels. Several vendors are producing improved systems with a variety of special drug and explosive identification features including computerized tomography. Most systems cost in the range of $100k to $300k; complex systems may cost considerably more.

Tanktruck and Tankcar Screening. Unsealing, opening, and searching truck and rail tankers used to transport propane and similar products is an expensive, time-consuming, and hazardous process. Since smugglers know this, these tankers present a real and significant threat. SAIC has developed a prototype gamma-energy scanning system for the detection of drugs or other bulk contraband concealed in the cargo areas of propane trucks and other gas or liquid tankers. The DoD and Customs are completing initial tests to determine the drug quantities that can be reliably detected, whether the vehicle's internal construction affects detection, and whether the device can detect drugs concealed elsewhere in the truck. The current configuration scans past a parked and unoccupied truck, can be easily set up or transported, and is estimated to cost under $400k for a complete system, albeit without any enclosure for the system or vehicle. SAIC estimates that it can adapt the system to scan slow-moving railroad cars with a 1 year R&D program costing under $500k. Because of radiation levels, it is doubtful that the system would be used by Customs against occupied vehicles. The use of a high-energy radioactive isotope as the source of the gamma radiation also will require consideration of such issues as licensing, badging of personnel, maintaining safety zones, and state or local environmental constraints.

Container Examination by Pulsed Fast Neutron Analysis (PFNA). SAIC also has built a prototype system utilizing pulsed fast neutron analysis for the discrete identification of drugs and other target materials in a truck or container. The DoD-sponsored system scored high in the detection of drugs under simulated conditions at the SAIC facility, but these tests did not involve full-scale containers, a wide range of cargoes, operational conditions, or a rigorous test procedure. The cost of a full-scale facility for testing PFNA under these more realistic conditions was $12M, and an operational system was estimated at more than $8M. Furthermore, to improve throughput rates and detection performance, SAIC suggests that PFNA be combined with a high-energy X-ray system in a configuration called PFNA-X; we would expect this configuration to significantly increase the cost, size, and complexity of the final facility. In total, PFNA for drug detection appeared to require a much more expensive, large, and complex system than Customs could envision deploying at the number of seaports requiring a container inspection system. In addition, if DoD were to provide $12M for the PFNA testbed, it would detract from their support of other non-intrusive inspection projects deemed to have greater potential for Customs implementation. Therefore, it was decided by DoD, with Customs concurrence, that construction of the PFNA drug detection testbed would not be funded.

A PFNA system could be very useful to detect explosives and other controlled and hazardous materials. As a result, the DoD is planning a multi-year, $18M R&D effort to develop and demonstrate a relocatable PFNA system capable of detecting these materials as well as drugs. If

the development effort resolves Customs concerns about the feasibility of PFNA for cargo examination, including safety and related issues, Customs will support the DoD in a test of the relocatable PFNA system at a major seaport. Under the present schedule, the prototype would be ready for these tests in 1998-1999. The contractor estimates that subsequent relocatable PFNA systems would cost $8M to $10M; however, if the systems were truly relocatable, it might be possible to utilize fewer systems overall than would be required by a fixed system.

Improved Drug Vapor and Particle Detection Devices. Drug detection devices applying various chemical analysis methods have been commercially sold for more than 10 years. Early systems were described as "vapor" detectors and presumed to be capable of detecting drugs "remotely"; i.e., without physical contact with the item being examined. The Customs Service was the leader in convincing industry and others that these early devices were not capable of detecting the extremely low vapor pressures typical of cocaine and heroin, and were instead dependent on picking up residual drug particles left on the target, which then were vaporized and analyzed by the device with considerable specificity. The collection of these particles required that the device be very close to the examination target or in actual contact with it. As a result, these devices were not suitable for the sampling of large volumes or surfaces. Considerable industry and government funding then went into developing such collection improvements as vapor pre-concentrators, separate collection vacuum devices, and wipes. These early devices, and even the more recent, typically had other practical limitations such as size, complexity, and cost. Today however, continued development and product improvement efforts are yielding a new generation of devices that overcome most of the earlier limitations and thus provide the promise of true remote sampling and detection of drugs. In addition to orders-of-magnitude improvements in sensitivity, most of these devices will offer portability, ease of use, and reasonable cost. Several systems and analytic methods appear to have considerable potential for expanded utilization in drug detection. Used either individually or in a complementary manner, these devices could permit new methods of searching containers, ships, cars, and other conveyances. Most of these devices should be available in the $10k to $50k price range. One caveat to their use is that they may respond to indications of drug use as well as drug smuggling; however, there are ways for Customs to deal with this possibility. In addition to these devices, new developments in biosensor technologies also have promise for operational application; while these methods may be expensive on a per-sample basis, they may have portability and covert deployment possibilities that would be advantageous for several inspection and investigative applications.

Potential Applications for the New Detection Technologies

The new generation of drug-specific detection devices could have several applications at land, sea, and air ports of entry. Vapor detection devices that really provide remote sensing capabilities comparable to that of a detector dog would permit the increased screening of cars, trucks, and cargo containers without requiring that they be moved to a secondary examination facility unless the device indicated the probable presence of drugs. Devices to detect drugs bottled in liquid form and devices to detect drugs that have been swallowed would be useful at airports and at seaports handling ships from threat areas.

Seaports and land ports would benefit from improved automated targeting systems to focus attention on the most highly suspect conveyances and cargo and to allow legitimate entries to proceed quickly through the port. Commercial ports need a larger pallet X-ray system for truck, sea, and air cargo; airports also may find the mobile vehicle X-ray and a larger pallet X-ray useful for baggage trucks and igloos. New baggage X-ray systems for drug and explosives detection may be useful in airport passenger areas to examine individual baggage and parcels. Drug vapor and particle detection devices also could be useful in screening airport passengers or baggage, as well as in passenger primary and secondary areas.

Ports on the Southwest border require a combination of systems to deal with smuggling by commercial and private vehicles. Customs intends to utilize automated targeting, intelligence, and commercial information systems; a land carrier initiative program; the truck X-ray system; and various other inspection procedures and devices to cope with this threat. The gamma device for empty tanktrucks and tankcars has high potential for ports with heavy tanker traffic and for the rail crossings. The DoD mobile X-ray system should be useful for screening passenger vehicles, to complement the truck X-ray or the gamma device in checking commercial vehicles, and possibly in the checking of railroad cars. Other inspection and anti-smuggling devices now being evaluated include pneumatic bollards, weigh-in-motion sensors, and automated inbound and outbound license plate readers. Southwest border ports also require technology applicable to trade enforcement and protection against the illegal movement of hazardous materials.

The Northern border is presently considered a lower threat for drug smuggling. The U.S. - Canada Accord on our Shared Borders emphasizes improved compliance and facilitation processes and shared systems for screening and examining cargo, vehicles, and persons crossing the border. Technologies presently of primary interest include screening techniques such as license plate readers, video systems, and biometric identification; inspection technologies such as drug vapor and particle detection devices, cargo and baggage X-ray systems, and other devices to look for concealed contraband or persons attempting to cross the border through the ports; and intrusion and observation systems to detect unauthorized crossings between the ports.

Commercial seaports, and particularly containerized cargo, are the greatest unsolved detection requirement at this time. As of today, container examination systems that may be technologically suitable are too high in cost, and affordable systems are not adequate. Finding the appropriate system for containerized shipments at seaports will require an interagency collaboration to thoroughly evaluate existing systems and those under development, and to identify the development and enhancement efforts most likely to produce a container examination system with the best balance of performance, cost, and operational feasibility.

It also may be necessary to explore new methods of financing these systems in the quantities that will be required to effectively cover all major seaports in the continental United States, Puerto Rico, and Hawaii. Information on these issues should be included in the ONDCP/CTAC Non-intrusive Inspection Systems Analysis and Engineering Trade-off Study now being completed. Seaports also constitute a risk for illegal outbound movements, such as currency and stolen cars.

PRIORITIES FOR TECHNOLOGY DEVELOPMENT AND ACQUISITION

In keeping with our strategy for technology development and acquisition, Customs intends to focus its resources and attention on new technology that is most likely to combine the requisite technical capabilities with operational and economic feasibility in our environment and for our requirements. We also realize that once new inspection technology becomes effective in finding concealed drugs, the drug smuggler will change his methods and attempt less risky methods of penetrating the port or the border; at this point the drug detection system becomes a deterrence system. While we would like this system to justify its continued operation in other applications, such as compliance measurement, we appreciate that a low cost detection system can be just as effective in deterrence as a high cost system, and less likely to attract attention as an unnecessary expense.

Customs immediate priorities for the development and acquisition of new drug detection technologies are the following:

Complete the acquisition of 11 additional truck X-ray systems for the Southwest border.

Conduct operational evaluations of the mobile vehicle X-ray system at Southwest border ports and then at selected seaports and airports.

Conduct operational evaluations of the gamma-imaging device for empty tankers at truck and rail ports on the Southwest border.

Evaluate the new EG&G pallet X-ray system at high-threat land and sea ports.

Lease a Heimann mobile 140 KeV X-ray system for operational evaluation at seaports and possibly land ports against inbound and outbound traffic.

Field test various improved drug vapor and particle detection devices at selected land, sea, and air ports.

Identify and acquire appropriate drug detection equipment for high priority programs such as Hard Line and Gateway.

Continue active involvement in on-going DoD development efforts, particularly for the pallet and vehicle X-ray systems.

Work with CTAC and DoD to identify a feasible system for the examination of containerized cargo; collect data through Customs channels on the performance and cost of truck and container examination systems operating overseas; evaluate recommendations provided by the CTAC Systems Analysis and Engineering Tradeoff Study; and, if needed, request funding from CTAC to improve and evaluate any existing systems with high potential for successful application.

Develop a landport module of the improved automated targeting system.

Complete the current evaluations of the automated license plate readers for inbound and outbound passenger and commercial vehicles, and of pneumatic bollards to deter port-running; to the extent warranted and possible, acquire these systems for the Southwest border ports.

Continue leadership and/or participation in interagency and international technology development and evaluation efforts such as the ONDCP Narcotics Detection Assessment Team and the Memorandum of Understanding with Canada Customs for the Coordination of R&D.

Evaluate new baggage X-ray systems, vapor/particle detection devices, and other systems jointly with Canada Customs at shared airports and Northern border ports.

In concluding, this description of Customs near-term plan for the development and acquisition of inspection technologies, two additional comments must be made. First, specific information on the resources required to implement this plan will be provided through the appropriate budgetary processes. Second, Customs use of technology must be responsive to outside and often sudden changes in areas beyond Customs control, such as the smuggling threat, technology breakthroughs, and Administration priorities; therefore the technology plan and the program it describes must remain dynamic and wide-ranging.

APPENDIX G-A

SOUTHWEST BORDER PORTS OF ENTRY

The Southwest border is 2,000 miles long; it presently is the drug smuggler's preferred place of entry, and up to 70 percent of the cocaine entering the United States is believed to come across this border. There are 38 commercial and passenger ports on the Southwest border; a total of 2.8 million trucks, 84 million cars, and 232 million people came through these ports in FY95. At one extreme of geography and workload is San Ysidro, California, the busiest land border port in the world; at the other extreme is Los Ebanos, Texas, where a hand-pulled rope-drawn ferry still transports a few cars and people each day to and from the United States. Every conveyance crossing this border is considered a threat for the smuggling of heroin, cocaine, or marijuana, as well as other prohibited or controlled substances.

As illustrated by the San Ysidro-Los Ebanos example, there are many differences among Customs ports, even those on the same border. These differences can affect the selection of the best inspection techniques and technologies for each port. On the Southwest border, the significant port variables are the type and volume of traffic and the geographic constraints.

Selection of Sites for the Truck X-ray

The number of loaded and empty commercial vehicles and railroad cars entering at each of the Southwest border ports in FY95 is provided in Table G-A-1.

Table G-A-1
INBOUND COMMERCIAL TRAFFIC IN FY95

Port	Loaded	Empty
Laredo, TX	444,680	371,288
El Paso, TX	268,190	251,844
Otay Mesa, CA	215,270	249,557
Nogales, AZ	155,205	67,267
Hidalgo, TX	116,850	55,918
Brownsville, TX	109,137	125,955
Calexico, CA	60,966	92,315
Eagle Pass, TX	55,227	34,081
Del Rio, TX	24,666	7,538
Tecate, CA	18,046	22,226
Douglas, AZ	11,630	14,709
Progreso, TX	9,067	13,711
San Luis, AZ	7,221	6,644
Rio Grande City, TX	5,021	6,549
Roma, TX	4,217	6,860
Presidio, TX	3,822	2,188
Naco, AZ	3,094	1,053
Santa Teresa, NM	2,303	1,899
Columbus, NM	1,890	1,013
Andrade, CA	1,022	2,790
Lukeville, AZ	237	1,113
San Ysidro, CA	182	1,631
Sasabe, AZ	172	589
Total	1,518,115	1,338,738

This data was the starting point for the selection of the ports to receive the new truck X-ray systems, but it was not the final determinant. Other critical factors were the planned addition of new commercial ports or facilities, the impact these changes would have on current workloads, and the geographic constraints at many of the ports.For example, the new port of Pharr, Texas, which just opened in April 1996, is expected to take a large share of the truck traffic now using Hidalgo; similarly, a new port at Los Tomates, Texas, is scheduled to open in December 1997, and is expected to get most of the commercial vehicles now using Brownsville. Major modernization and expansion at Calexico is to be completed in July 1996, but growth in traffic is dependent on construction of Mexican facilities. Santa Teresa is scheduled to open late in 1997 and is ultimately to take most of the commercial traffic from downtown El Paso, but this is very dependent on construction of the Mexican highway net and the relocation of railroad tracks on both sides of the border.

Several ports have insufficient room within the Federal property to fit the truck X-ray system and/or the associated traffic flow. For security reasons, Customs will not operate truck examination facilities that are not on, or immediately adjoining, the Federal inspection facility. Finally, one port is located on a flood plain making permanent below-ground construction inadvisable.

The sites selected for the 12 truck X-ray systems are listed in Table G-A-2. The order and schedule of installation are influenced considerably by current or impending port construction by GSA, as well as GSA's schedule for construction of the X-ray facility.

Table G-A-2
SITES FOR THE TRUCK X-RAY SYSTEMS

Otay Mesa, CA
Calexico, CA
El Paso, TX (Ysleta)
El Paso, TX (Bota)
Pharr, TX
Los Tomates, TX
Nogales, AZ (West)
Hidalgo, TX
Laredo, TX (Columbia)
Santa Teresa, NM
Brownsville, TX (Los Indios)
Otay Mesa, CA (second system)