INTERDICTION TECHNOLOGIES

The process of interdicting drug smugglers consists of five broad categories of activity: intelligence, command and control, surveillance, pursuit, and capture. Figure 11 illustrates the general nature of these activities.

Intelligence plays an important role throughout the interdiction process. Intelligence simplifies the separation of smugglers from legitimate traffic and may provide advanced information on departures, routes, destinations, and where drugs are hidden. Intelligence also provides information on the effects of interdiction activities on smugglers. Technologies for intelligence are not discussed in this report for security reasons, although the types of intelligence collected and the mechanisms for distribution are noted.

Command and control provides the mechanism to manage information about a potential target and to select, distribute, or display that needed for operational decisions. Data links, computer systems, and secure communications are important components and are key to effective command and control systems. Central command structures for operations involving more than one agency or branches of an agency are also essential to make effective use of command and control technologies.

Surveillance is the process of watching for and detecting potential targets. Surveillance technologies cover a broad spectrum from binoculars to advanced radar.

Pursuit is the process of tracking a suspected target either remotely or by close visual or sensor contact. The actual identification of a target is made by sighting, with or without the aid of sensors (some of which may be used for surveillance), and comparing distinguishing features, such as aircraft tail numbers and vessel names, with smuggler profiles and intelligence information obtained through computer databases and command and control systems.

Capture is the process of stopping and searching the suspect, seizing drugs, making arrests, and collecting evidence. Technologies for pursuit and capture are often the same, including airplanes, helicopters, ships, and land vehicles.

Interdiction at ports of entry involves these same basic activities, but is discussed separately since different technologies are used. Technologies to find drugs at ports of entry range from computer data systems and vapor detectors to probes (pointed metal rods).

Following is a summary of available and prospective technologies, their capabilities and limitations, and the capabilities and limitations of enforcement agencies in using technologies.

Generic Limitations

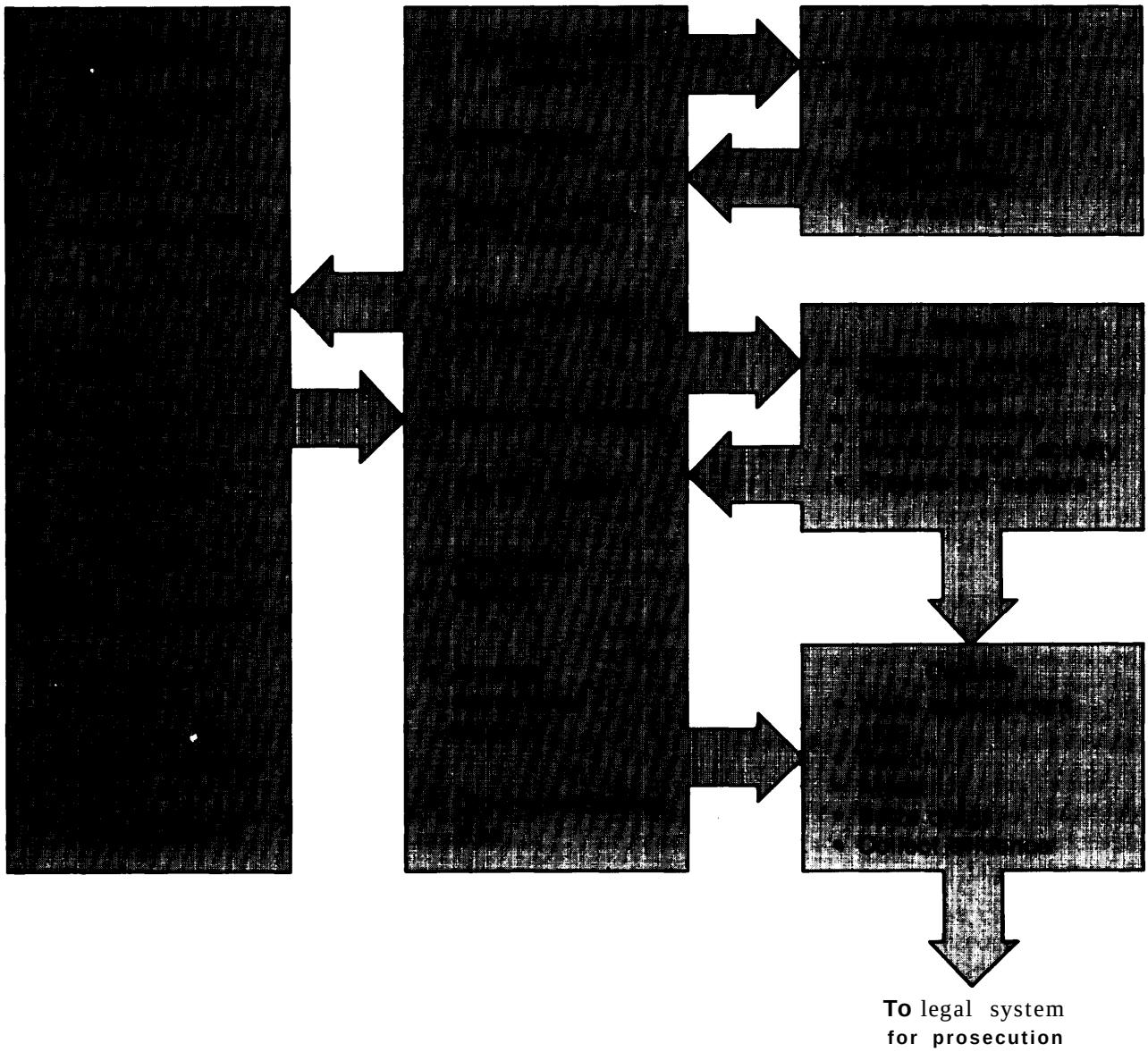
The contribution that technologies can make to drug interdiction is constrained by three generic factors. First, all technologies presently or potentially available have inherent limitations. For example, radars have range, discrimination, and reliability limitations. Airplanes have range and speed limitations. X-ray machines can detect only certain objects or abnormalities. Second, even the best technologies are no better than the organizational, human, and financial resources available to deploy them. For example, the best radar operated by an organization with limited funding and personnel is of little value during those periods when it is not in operation. Third, strategies for using technologies establish limitations. For example, the Air Force system disregards targets of greatest interest to law enforcement agencies. It is not that the radars fail to detect those airplanes. Rather, the Air Force has an information management problem with a massive number of aircraft entering the United States. The Air Force, thus, collects and uses only information directly relevant to its primary mission, and that is not drug interdiction. To give another example, the need to rapidly process individuals at ports of entry results in only limited use of technical aids that slow down processing.

Intelligence

The principal Federal agencies involved in drug interdiction operations have their own intelligence collection and analysis apparatus. Three kinds of intelligence information—strategic, tactical, and operational—support interdiction activities.

Strategic intelligence is collective information on all aspects of drug availability, use, abuse, cultivation, production, and smuggling. Such informa-

Figure II.—Interdiction Functions



SOURCE: Office of Technology Assessment, 1987.

tion provides a comprehensive overview of the drug environment. It is used to keep managers and policymakers advised on the drug situation, to make projections, and to provide a basis for decisions about resource deployments.

Tactical intelligence is immediate, actionable information on an anticipated drug smuggling activity that can be used as a basis for pre-positioning interdiction resources. DEA's El Paso Intelligence Center (EPIC) is primarily responsible for managing this type of information.

EPIC manages an extensive database on drug smuggling levels, routes, individuals, organizations, equipment, and seizures. Consolidated and evaluated intelligence information is disseminated in both hard copy and verbal form, as appropriate. Many

automated data systems maintained by individual agencies are accessible through EPIC. Such systems include information on suspect individuals, aircraft, boats, and vehicles.

Operational intelligence is systematically organized information on a specific active or potential drug smuggling individual or organization. The information relates to the individual target's activities, resources, and apparent vulnerabilities.

Intelligence is collected by special agents operating in source countries and the United States as well as by other methods. Communication of tactical and operational intelligence to interdiction agencies occurs through EPIC, NNBIS, and the individual agencies' command centers.

Some experts believe that the best prospects for increasing the effectiveness of the Federal drug interdiction program lie in expanding and improving the intelligence collection, consolidation, analysis, and dissemination process. According to a Customs' analysis of their 1985 seizures, prior information was used in a majority of large cocaine seizures, accounting for the bulk of the volume seized.

The current procedures for sharing time-sensitive intelligence data are sometimes cumbersome. The Customs Service and the Coast Guard each maintain and operate their own marine interdiction C^3I (command, control, communications and intelligence) centers; in fact, the Customs Service maintains separate marine and air interdiction C^3I centers. Separate Coast Guard, Customs, and DEA intelligence activities have created problems in coordination of operations on a day-to-day basis. These agencies do not always cooperate on collecting and distributing vital tactical intelligence, they cannot usually communicate on secure lines with each other, and information from the intelligence community is not always equally available to field units. A lack of intelligence flow could be a major impediment to effective use of any new C^3I technology to be developed in the future. The problem of secure communications was resolved for a recent special operation, but much remains to be done to incorporate this progress into routine operations.

Photo credit: Border Patrol

Command and control centers are the key to effective use of modern sensor technology for interdiction.

Command and Control

Effective drug interdiction requires the capability for rapid information exchange and reliable, secure, and quick command and control of operational units. The Customs Air Branch, Customs Marine Branch and Coast Guard each have their own command and control centers and networks. The Coast Guard has a nationwide command system that is probably the most comprehensive in coverage. Customs Air Branch has four operating centers. Three of these (in Miami, Houston, and Albuquerque) are colocated with the FAA air traffic control centers and the fourth is at the Regional Operations Control Center, March Air Force Base, Riverside, California. In 1986, the Customs' Marine Branch initiated a new center in Miami. There are many opportunities for technological improvements (data handling, sorting and analysis, display, etc.) in all the centers but the most serious deficiency is that a working plan for coordinated operations and command is not in place. Customs has initiated the development of new C^3I centers and the 1986 Anti-Drug Abuse Act calls for the several agencies to cooperate on a center design.

The technologies available to provide secure voice communications, which cannot be monitored by drug smugglers, are generally unsatisfactory but

slowly improving. None of the individual agencies appear to have the kind of technology for information exchange and command and control that they believe to be necessary. The problems in some instances are lack of resources to procure the necessary secure communications technology. In addition, each of the agencies tends to have its own communication equipment and standard operating frequencies that are often incompatible. The problem is a particularly serious one in terms of the ability of operational units of the various agencies to communicate with each other. Even when there are coordinated command and control centers such as that represented by the Blue Lightning Operations Center in Miami, incompatible communication equipment sometimes precludes the Center from communicating with operational units. During recent special operations, military equipment was used to resolve this problem. But, there may be higher priority national security concerns that would preclude the use of this military equipment for routine drug law enforcement.

Photo credit: Westinghouse, TCOM

A surveillance radar is mounted on this large, tethered balloon to detect low-altitude smuggler aircraft.

Surveillance

Aircraft

The Nation's largest civilian aircraft surveillance system is operated by the Federal Aviation Administration. This system provides two types of radar coverage: control over airport approaches and departures, and surveillance of flights between airports (the en-route system). The en-route system covers virtually all of the continental United States, but generally at altitudes above 10,000 feet and with almost no coverage below 5,000 feet. The FAA radar system provides a basic map of the Nation's air traffic including all flights operating on instrument flight rule (IFR) plans. Its value to interdiction is primarily in detecting, and separating out, many planes not likely to be smugglers, since smugglers normally fly below 1,000 feet and without flight plans. However, the altitude band below 10,000 feet also contains large numbers of general aviation aircraft operating on visual flight rules, flights that are very difficult to distinguish from smugglers by means of radar.

The Customs Service seeks detection of smugglers through the FAA radar network, equipment under its own control, and equipment operated by DOD agencies.

One recent addition to Customs' surveillance capability is an aerostat-mounted radar (a tethered balloon supporting a radar antenna) in the Bahamas. This radar provides Customs with surveillance of the Bahamas and the northeastern reaches of the straits of Florida and has enhanced detection of flights coming through this area bound for Florida. Customs plans to add additional aerostat radars along the Mexican border as well.

Customs also operates radar surveillance aircraft. In addition to their surveillance capability, some of these aircraft can lock on and track targets. On a recurrent basis, Navy surveillance aircraft provide support during regular training and routine patrol flights. On occasion, they fly designated surveillance missions at the express request of Customs. During 1985 Navy aircraft flew several hundred sortees for Customs. The Air Force's airborne warning and control system (AWACS) aircraft provide similar support to Customs.

There is also a Navy radar at Guantanamo Bay, Cuba, which provides surveillance of air and surface targets. Air Force operated aerostat-mounted radar at two locations in Florida provide both air and surface target information. Information from

these systems is shared with the Coast Guard and Customs Service.

As extensive as this coverage may appear, it has many limitations. Large areas of the southern border have no radar coverage under certain conditions and at certain times. Even where radar coverage is available from the FAA, it can seldom pick up airplanes flying at the altitudes normally used by drug smugglers. The aerostats and the various airborne radar platforms available to Customs cover relatively small areas, albeit corridors of heavy drug traffic, and their coverage is not continuous.

Improved radars with longer ranges and greater detection capability could contribute to interdiction. Similarly, operation of more radars or existing radars for longer periods of time could enhance interdiction. Providing continuous coverage of all possible smuggling corridors by airborne radar would be very expensive, assuming that the equipment could be made available at all. A possible alternative to designing a radar surveillance barrier is to develop an approach similar to a military air defense system that provides increasing levels of detection, identification, and tracking of targets as they approach U.S. borders.

Perhaps a significant improvement in long-range and wide coverage radar surveillance of the Southern border could be added when DOD installs the planned south-looking, over-the-horizon (OTH) radar in the 1990s. This radar could provide nearly complete coverage of the Caribbean and Gulf of Mexico, at least in theory. If it is to be used for drug interdiction purposes, however, there is a need to incorporate certain special features into the system, and provide links to transmit data to the appropriate drug enforcement agencies. Alternatively, it may be possible to develop a dedicated OTH system for detection of smuggler aircraft.

In sum, existing capabilities for surveillance and detection of smuggler aircraft are limited over most of the Southern border. Increases in this capability are planned but, with present uncertain knowledge about trends in the air threat, it does not appear wise to invest in a large fixed radar barrier. Rather, it may be more prudent to make incremental improvements, make use of existing defense programs, and gain more insight on future smuggling patterns. Flexibility is necessary in responding to any specific current threat.

Vessels

Surveillance of vessels smuggling drugs into the United States is being modified to use a wide variety of technologies,

Airborne sensor systems, mounted on fixed-wing aircraft or helicopters, are either now in use or being brought into operation by the Coast Guard. Surveillance radars are mounted on two types of aircraft. In addition, the Coast Guard has forward-looking infrared systems, and a new multi-sensor surveillance package known as AIREYE is being evaluated. AIREYE has the potential capability of both wide area surface search by radar and short-range target identification using a laser-enhanced TV.

The Coast Guard has tested aerostat-mounted radars tethered to ships which provides long-range surface search capability. The Coast Guard plans to acquire several of these systems principally for the purpose of locating suspect vessels in the channels and passages between South America and the U.S. coast. Finally, the Coast Guard uses its medium- and long-range aircraft and helicopters for radar and visual surveillance of suspected drug smuggling vessels. Some have advocated that, in the future, the Coast Guard could also contribute to surveillance and tracking of private aircraft smuggling since many Coast Guard missions in the Caribbean operate over the same regions known to be air smuggling routes.

The surveillance technologies used by the Customs Service to detect vessels suspected of smuggling drugs—mainly in coastal and inland waters—roughly parallel but are more limited in scope and coverage than those used by the Coast Guard. Coast Guard surveillance technologies, at times, generate data which are provided to Customs.

The Customs Marine Branch also operates its own radars. It has installed a few radars on the tops of tall buildings and towers in south Florida and plans to add more in Florida and along the Gulf Coast. It also has small vessels equipped with surface search radars.

The limitations of marine surveillance technologies are similar to those used for air surveillance. Both the Coast Guard and the Customs Service are investigating improved technologies. The goal is to provide more extended and/or more discriminat-

ing coverage for longer periods of time and for reasonable costs. None of the proposals for new technologies, however, offer the likely prospect of a fundamental breakthrough. Rather, they offer incremental improvements.

Land Border

The Border Patrol uses a variety of technologies on the Mexican border to detect illegal intrusions. There are a large number of unmanned sensing devices linked to computer-equipped base stations that can direct Patrol officers to investigate intrusions. Sensors include several types. Buried seismic sensors detect soil disturbances created by intruders. Magnetic sensors detect metal in the small amounts carried by people, while magnetic vehicle direction sensors detect the presence and direction of vehicles. Infrared sensors detect heat emissions from humans or animals. A number of manned infrared systems for vehicles and persons are also in use. The Patrol also has night vision goggles and pocket-sized starlight scopes. Low-light-level television systems are installed on the Mexican border and more are planned. The Border Patrol uses cars, trucks, and other types of land transportation. It also has fixed-wing airplanes and helicopters for visual surveillance. Plans are for forward-looking infra-red systems to be mounted on some helicopters. The Patrol is also testing four-wheel drive vehicles outfitted with either an infra-red imaging device or a low-light-level camera TV mounted on a telescoping mast that can extend in the air.

None of the devices used by the Border Patrol has the capability of discriminating drug smugglers from the millions of other intruders that come across the Mexican border.

Photo credit: Border Patrol

The Border Patrol has developed imaging sensors for use on vehicles that can patrol the rough terrain of the Mexican border.

Pursuit and Capture

Aircraft

The Customs Air Branch uses aircraft for interception, tracking, and apprehension of drug smugglers. The desired capabilities for tracking and intercept airplanes relate to cruise speed, capacity to stay aloft without refueling for a set amount of time, and adequate sensor equipment such as radars and infrared sensors to allow for tracking smugglers at night without making visual contact. Customs expects to have several aircraft that meet these criteria.

The Air Branch presently has a few aircraft with the requisite sensor capabilities and speed, but their endurance is more limited. Customs also has other types of aircraft for tracking, but they are not equipped with radar and must rely on ground controllers or visual intercept methods. Once on the trail of a suspected drug smuggler, however, these aircraft do have forward-looking infra-red detection systems that allow them to follow suspected drug smugglers. Finally, the Air Branch has a support fleet of other twin-engine, single-engine, and rotary-wing aircraft (none of which have special sensor equipment) that are used for daylight operations. Suspicious aircraft can be checked against data systems with information on flight plans, stolen aircraft, etc.

All Customs airplanes can be used in the task of apprehension where no specially equipped aircraft are available or within range of the arrest site. The most effective aircraft for arrest, however, are Black Hawk helicopters acquired from the Army. Of all of the aircraft in its inventory, Customs has found the Black Hawk to be particularly effective for apprehension. It has the speed and range needed and is equipped with night vision goggles for the aircrew and a powerful search light. Also, the Black Hawk has a large cabin that accommodates an arrest team in addition to the pilot and co-pilot.

The air interdiction resources of the Customs Service are clearly limited. First, Customs has a very small number of aircraft to cover border areas. Second, only a few Customs aircraft have the necessary performance characteristics—speed, range, and sensor equipment. The challenge faced by the Air Branch can be perceived when one remembers that 3.5 to 10 smuggling flights cross the Southern border every day.

Vessels

Some of the vessels used by the Coast Guard and the Marine Branch of the Customs Service for pursuit and arrest differ significantly. The Coast Guard uses vessels that give it greater fire power and longer endurance. Further, the Coast Guard is required to advertise its presence. Coast Guard vessels are clearly identifiable. By comparison, the Marine Branch of Customs relies on vessels which are small, high speed, and capable of only brief sorties. Most have no distinctive insignia since Customs relies more heavily on blending in with other boating traffic.

Coast Guard cutters and patrol boats carry a variety of sensors used to identify vessels suspected of drug smuggling. These include ship-mounted radars and small optical sensors and night vision devices. The Coast Guard has under development an electro-optical sensor system to be mounted on its cutters. Its role is to enhance the capability for identifying vessels during darkness or periods of poor visibility. In addition, Coast Guard vessels have night vision scopes and gyro-stabilized binoculars, plus scanners for both VHF and UHF radio transmissions. Most cutters have been recently fitted with secure voice radio systems to protect their communications from monitoring by smugglers.

For the capture of drug smuggling vessels at sea, the Coast Guard mainly uses its cutters and patrol boats plus some special vessels such as its surface effect craft fleet and the Navy's hydrofoil fleet out of Key West, Florida. The Coast Guard also sends drug interdiction teams on board a variety of larger Navy combatant ships when available. Coast Guard vessels are designed for ruggedness, endurance, multi-mission capability, and ease of operation. These characteristics give the Coast Guard a number of advantages that sometimes compensate for relative lack of speed compared to many smuggling vessels. For example, when the seas build up, a larger "slow' Coast Guard cutter can often catch a "go-fast boat' which must slow down. The Coast Guard also uses some portion of its small boat fleet stationed along the entire U.S. coastline.

Customs, by comparison, uses small fast boats that are dedicated to drug missions. Customs plans to have several new interceptors outfitted with radar. Since Customs seeks vessels that blend in with other boats, they generally use designs that are already commercially available. Customs has on order several high-speed catamarans that it believes will offer greater maneuverability, tighter turning, and better stability in rough seas than the boats used by smugglers. These are meant to be used in a chase boat strategy.

Both Customs and Coast Guard must make critical judgments about where to place limited num-

Photo credit: **US.** *Customs Service*

Customs' high-speed interceptors operate in coastal waters such as south Florida where smugglers attempt to dash from offshore islands to secluded coves on the mainland.

bers of vessels or patrols and other apprehension resources. Many areas are left unpatrolled, and thus may be open to smugglers, resulting in no knowledge of their activities. The recent change in smuggler tactics by using air drops at night to small vessels stationed offshore makes the problem very difficult. Customs also suffers from a lack of trained boat operators especially since they have recently acquired a large number of new vessels.

Finally, the Coast Guard has worked with Customs to develop a variety of sensors used to find hidden compartments on vessels that may be used for drug smuggling. Much of this equipment was developed for Customs to find drugs at ports of entry.

Detection at Ports of Entry

Customs uses a variety of technical aids to help meet the two goals of detecting drugs at ports of entry while simultaneously moving legitimate traffic rapidly through the inspection process.

The TECS (Treasury Enforcement Communication System) database provides information on specific individuals, vehicles, private aircraft, and vessels suspected of smuggling or other illegal operations. TECS terminals are available at all ports of entry, but their use is limited by the time required for entering data and by maintenance problems. These problems are being addressed by programs aimed at development of an automatic passport reader, an automatic license plate reader, and equipment replacement. However, such problems as the time and personnel requirements for entry of names of individuals carrying foreign passports have not been solved by these innovations.

A computer database for cargo is operational at a few ports and under development at others. At most ports, manifest and invoice information are manually compared with profile data on importers, commodities, manufacturers, and countries of origin. About 20 percent of the cargo entering the United States is identified as high risk (for all purposes, not just drugs). Roughly 3 percent of high risk cargo is subjected to an intensive enforcement examination. The remaining high risk cargo receives a brief compliance examination where one or more items are inspected. Only documents are reviewed for the 80 percent of cargo that is not considered to be a high risk. The development of expert systems offers the prospect of refining cargo selectivity by facilitating the transfer of individual inspector knowledge and developing risk rankings and inspection priorities.

The range and quantity of equipment used to detect drugs at ports of entry is quite limited. At present there are several parcel X-ray systems used primarily to inspect airport baggage, a few X-ray systems located at mail examination facilities, a few sets of special probes, several fiberscopes, and ultrasonic range finders. Wind tunnels (vapor detectors) will soon be installed at an airport to screen passengers. In addition, major ports of entry have specially trained dogs to detect drugs. While dogs are capable of directly detecting scents from drugs, most tools in use only indicate abnormalities in materials or detect chemicals associated with drugs. In all cases, manual inspection is necessary to verify the presence of drugs.

The Customs Service continues to investigate a range of more advanced detection technologies, but few have been found that meet the requirements of Customs inspectors. Two critical requirements are speed of operation and accuracy (low false-alarm rate), since inspectors must facilitate traffic through the ports of entry in addition to enforcing drug laws. Further, the technologies must be acceptable to the inspectors, that is, they must have the characteristics of ease of operation, durability, and compatibility with normal working techniques.

Significantly different technologies and strategies will be required for anything more than an incremental improvement in drug seizures. However, Customs has inadequate funds for the new technology development needed to support port-of-entry drug interdiction functions. Available resources are very limited for developing innovative approaches to detection and testing and refining commercially available devices. Perhaps the greatest deficiency is the lack of funding for studies of the chemical and physical properties of drugs.

Customs is pursuing technological developments in three areas that would be especially helpful for drug interdiction at ports of entry. First, technologies that speed the inspection process. One example is advance manifest systems for cargo. Such systems allow Customs to select what will be inspected prior to arrival and low risk cargo can be electron-

ically released. Second, technologies are needed that can detect drugs. Work is well underway on a nuclear magnetic resonance system designed to detect heroin and cocaine in letter mail. Most vapor approaches have been limited by technical problems associated with obtaining a sample from concealed drugs. Third, technologies are needed that can more effectively detect hidden compartments. One example being investigated is an imaging gamma backscatter detector designed to identify abnormalities in materials,

A critical need of Customs inspectors is the ability to select people and parcels to inspect. Profiles are the primary means used for selecting people and cargo for detailed inspection. Data systems and analyses that would quickly respond to the changing profiles of drug smugglers and drug smuggling techniques could potentially be very useful. There are opportunities for improving selection techniques and some are being pursued. These may enable Customs to improve interdiction rates but a statistical database to measure these improvements is not now available. It would be essential to have such a measurement system in effect both before and after new techniques are deployed to evaluate their effectiveness.