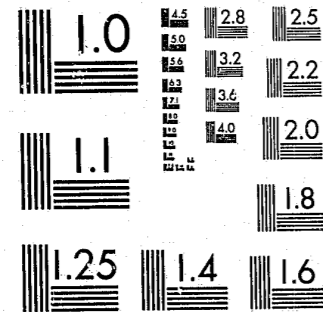


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United States Department of Justice  
Washington, D. C. 20531

3-29-82

41753

TECHNICAL REPORT NO. LWL-CR-60DJ71

TRAINING DOGS FOR NARCOTIC DETECTION

Final Report

By

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July 1972

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## PREFACE

The abuse of hard narcotics (heroin and cocaine) has risen sharply in recent years, and coping with this problem has become an important responsibility of law enforcement agencies. In order to assist these agencies in adequately carrying out this increasingly important responsibility, methods have been developed for the training and use of narcotic detector dogs.

Several advantages are inherent in the use of dogs to detect narcotics. First, dogs can detect faint odors from narcotic substances which are actually considered odorless to humans. Second, they can be trained to detect and respond to more than one narcotic substance. Third, they can be trained to search an area more quickly and efficiently than a man. And fourth, since the dog relies primarily on odor cues, it can detect narcotics in boxes, baggage, and in other places of visual concealment and can make the detection without having the package opened or otherwise dismantled.

Considering these advantages, it is obvious that a good detector dog and a well trained handler can search for narcotics rapidly and efficiently. A detector dog can be a valuable asset in narcotic detector work and this manual is designed to describe, in a step by step fashion, how to train dogs to effectively search out and respond to hard narcotics.

### Addiction of Dogs to Drugs

The question has been raised concerning addiction of dogs trained to detect hard narcotics. There is no evidence to support the contention that narcotic detector dogs become, or even run the risk of becoming, addicted to the narcotics which they are trained to detect. In fact, all the evidence is to the contrary.

At no time during the training of the narcotic detector dog does the animal come into physical contact with the narcotic agents. All substances are packaged prior to being utilized as training samples, and the manner in which the narcotic samples are packaged, described in this manual, precludes the possibility of particles being expelled into the atmosphere. The training procedure discussed in this manual does not encourage the animal's attacking or otherwise attempting to "get to" the samples used in training, consequently, the only contact the dog has with the narcotic sample is the odor associated with the sample package.

Several dogs have already been trained to the narcotics discussed in this manual. Although the question of whether a dog can or cannot be addicted to one or the other of the narcotic agents has not been answered, there have been no behavioral or physiological indications that any of these animals were in any way affected by the narcotic agents to which they were trained. No pupillary changes have been observed, nor were there any discernible behavioral or physiological changes in any of these dogs following training or between these dogs and other dogs trained to detect non-narcotic agents.

The behaviors expected in animals which ingest or become addicted to a narcotic agent, such as lethargy or otherwise disrupted motor behavior, have not been noted. No dog has attempted to ingest or otherwise assimilate any of the narcotic agents; in fact quite the opposite has been true. All dogs upon detection of the narcotic agent very quickly turn away from the narcotic sample and toward the handler for food reward.

## I. INTRODUCTION

The purpose of this manual is to present in a step by step manner a training procedure which has been demonstrated to be an effective method for training dogs to detect narcotics. It should be emphasized that the *entire manual* should be thoroughly understood before any training is begun.

No special equipment is needed to train the dog to detect marihuana, hashish, or opium. There is special equipment necessary when working with cocaine and heroin. *No training with these two narcotics should be attempted until all the equipment has been set up and is working properly.*

Two persons will be required to properly train a narcotic detector dog. Both persons will serve as trainer and handler. Although two persons are required to train one dog, these two persons could easily train two, three, or more dogs.

### A. Selection of Dogs

The most important factor in beginning a detector dog project is the correct selection of dogs for the project. Although there has been no conclusive demonstration that any particular breed of dog is best suited for detection work, the Canine Behavior Laboratory of the University of Maryland recommends German shepherds and Labrador retrievers as breeds having a good combination of sensory capacities and good temperament.

This manual is based on procedures developed during the training of dogs to detect odors from narcotic materials. Three dogs were selected from a group of seven to complete the narcotic detector training. One male German shepherd, one male black Labrador retriever, and one male golden Labrador retriever were selected. Each of these dogs was equally successful in completing the detector training, which suggests that a dog's individual temperament is more important as a selection criterion than the breed itself.

There is evidence to suggest that a dog which has already demonstrated itself as a working dog could be utilized in detection training with a considerable savings in time and money. The working police dog and the military working dog are two prime candidates for this training.

Every dog selected for narcotic detection training should meet certain physical and temperamental standards. The following is a list of these standards.

#### 1. Physical Standards

The selected dog should

- Be free of distemper, infectious canine hepatitis, leptospirosis, mange, heart worms, rabies, ectoparasite infestation, or other health conditions deemed unacceptable by a veterinarian,
- Have no greater than Grade 1 hip displasia, either judged clinically or by X-rays,
- Have completed a standard immunization series against disease, and
- Be fully grown.

#### 2. Temperamental and Behavioral Standards

The selected dog should also

- Give evidence of inquisitiveness, with a desire to explore the environment, especially, an apparent interest in odors as evidenced by sniffing of new objects,
- Be neither overly aggressive nor shy of people,
- Be highly interested in food, an "eager eater," and
- Be responsive around people.

Most reputable dog breeders will agree to sell a dog conditionally, and, if possible, a dog should be purchased with the condition that it could be returned after a 10-day observation period if it does not meet all physical and temperamental standards. During the observation period, a qualified veterinarian should examine the dog to determine that it meets required physical standards, and a trainer should determine that the dog meets the necessary temperamental standards.

Simple observation tests can be used to determine if a dog is potentially temperamentally suitable for training. By taking the dog into a new environment, a trainer can observe whether or not the dog is inquisitive. For example, taken into a room in which there are boxes or containers such as foot and wall lockers, or furniture such as desks and tables, a naturally inquisitive dog will move about and examine these objects and, most importantly, it will sniff them.

Similarly, a dog's timidity and aggressiveness can be checked by taking the dog into a room where two or three "strangers" are present. If the dog proves shy of strangers, or aggressive toward them, it is not a good candidate for detector dog training.

Another important observation is whether or not the dog is a hearty eater; this is a good indication that food will be a powerful reward.

A dog in new surroundings may require an adjustment period and should not be judged too quickly. Normally the full observation period of 10 days will be needed to determine what a dog's behavior will be like over a more extended period.

In selecting dogs for training, twice as many should be selected as will actually be needed. In this way, the training quota can be met even if some of the dogs are rejected during training. If more dogs than are needed successfully complete training, the best dogs can be selected to fill the quota.

## B. Rewards and Punishment

The presentation of rewards or punishment, with dogs as with humans, serves to change the behavior of the animal. When a reward is presented immediately after the dog makes a particular response, the likelihood of that response occurring again is increased—the opposite is true of the administration of punishment. It is easy, then, to see how certain behaviors can be modified so that they are more likely or less likely to occur simply by presenting rewards or punishment following certain behaviors.

### 1. Reward

When a dog first smells a narcotic, it may sniff it and exhibit curiosity, but the odor has little additional effect on its behavior. However, if every time the dog smells a narcotic odor it is given food and put in a sitting position, this sitting response is more likely to occur the next time that it detects this odor. The problem here is, of course, that the dog does not "understand" that sitting to a narcotic odor is what results in the presentation of food, and it will probably sit to the odors of many different objects. If the handler does not present the dog with food when it sits to other odors, the dog will learn to discriminate between odors that are followed by food when it sits (certain narcotics) and odors which are not followed by food (all other odors).

At the final stages of training, the dogs will search for the odor of the particular narcotics that result in the delivery of food. The major thing to remember is that the dog will sit in the presence of a narcotic odor only so long as it is given a reward for this behavior. It does not have to have a reward on every trial, but it does need to have frequent rewards when it responds to the correct odor. If the dog works for long periods of time without reward or if the reward is given at the wrong time, the dog's behavior will break down and it will either fail to search or fail to sit at the correct odor.

A short discussion of the use of punishment should clarify some of the reasons why excessive punishment is not the most effective way to train a detector dog, and may, in fact, be harmful to its training.

### 2. Punishment

There are very few times when the use of extreme punishment will best serve to correct the dog for an undesirable behavior. A stern NO, during or immediately (not later than 3 sec) following the undesired behavior, will generally serve to reduce the chance of the behavior's reoccurring. It should be emphasized that, generally, no physical punishment should be given during training sessions.

Punishment is effective in altering a dog's behavior only when administered following a behavior you do not want to occur, for example, if the dog bites someone.

Effective use of punishment can occur only after a good bond is established between handler and dog. Punishment tends to make the dog more handler-oriented and is especially ineffective for shy dogs.

If you want the dog to perform, reward it for doing what you want it to do, *but never punish the dog for not doing it*. Not only is punishment ineffective in getting the dog to do something, but it will cause the dog to fear the punisher and the place where it is punished. The effect of fear is to disrupt other behavior which, in many cases, may be desirable behavior. A fearful dog that receives punishment while searching will not make a good detector dog.

Many traditional dog trainers make extensive use of the choke collar as the primary tool in the training of dogs for various tasks. Although this practice is not recommended for the training of detector dogs, its effectiveness is recognized. The careful and limited use of the choke collar may be effective with dogs which do not respond to the less severe punishments recommended in this manual.

Specifically, it is recommended that the jerk on the choke collar be used only under the following conditions: (1) if the dog bites another animal or a human; (2) if the dog runs away from the handler; (3) if the dog growls at a person or another dog. If any of these behaviors requiring the use of the choke collar occurs, it is further recommended that a professional dog trainer who is thoroughly familiar with the use of the choke collar conduct this training.

### 3. Spoken Commands

Spoken commands, such as GOOD DOG and NO, have no meaning to the dog except in relation to the events which follow these commands. If pleasant consequences follow the word GOOD, then eventually the word becomes rewarding to the dog. With proper training the word GOOD will continue to be rewarding to the dog even if it is only occasionally followed by food and petting. The same is true for NO when used as punishment. Granted, a very loud NO may itself be punishing because of its startling effect; however, its effectiveness as a punishment results primarily from the unpleasant events which follow the verbal command. Thus, if a behavior occurs and is immediately followed by the word NO, that particular behavior will be less likely to reoccur. If the verbal NO is never followed by some unpleasant event, it will gradually lose its effectiveness in controlling the animal's behavior.

For any other unwanted behaviors, such as sitting when no narcotic odor is present, the NO should be paired only with a TIME OUT, a procedure which is described later in this manual. This procedure assures that NO will continue to function as an effective means of eliminating unwanted behaviors. *It is strongly recommended that NO and the TIME OUT procedure be the only punishment used during the training of detector dogs, except for the behaviors of running away or growling at or biting people or other dogs.*

Remember, the most effective way to control the dog's behavior is by rewarding it for desirable behaviors; you may reward it with food, praise, and petting.

a. *Food.* When the dog detects a designated odor and sits, it expects to receive food. If the dog sits to some other odor, it should not expect to receive food. Therefore, it should receive its reward only when it makes a correct response, i.e., when it sits to the odor that it is being trained to detect. *Do not give the dog food during the search training except when it makes a correct response.*

b. *Praise.* Praise should accompany food as a reward. The verbal GOOD DOG is given prior to giving food to the dog when it has made a correct response. You will verbally encourage the dog to search and praise it when it is doing a good job of searching. Praise will become more and more effective as a reward for the dog the longer you work with it.

c. *Petting.* Praise should be coupled with petting when the dog makes a detection. Petting the dog as it is praised is very rewarding to it and will keep it working much in the same way as food does.

## C. Maximizing the Effectiveness of Food as a Reward

The present dog training procedures differ from the traditional ones in that they do not rely on punishment for failure to respond, nor upon the dog's "affection" for the handler (the "one man, one dog" relationship). Petting and praise, although administered for correct responding, are regarded as auxiliary rewards only, since their effectiveness will vary from dog to dog and from handler to handler. The principal reward for a correct response is a pellet of food.

The procedure to be described will insure that any handler will be able to use food as a powerful reward for any dog that has met the selection criteria. Moreover, the effectiveness of food will be maintained even when the dog is shifted to a completely new handler. Any properly trained handler will be able to work any properly trained dog.

While some dogs are highly rewarded by almost any kind of food, most prefer foods that would be impractical to use for routine training purposes. To be suitable for use in training, the reward food should be in the form of dry pellets. These are convenient to carry and to administer and require no refrigeration. To make dry food pellets rewarding to any dog, it is only necessary to have the dog hungry. Depriving the dog of food for a period before working may not be sufficient for all dogs; many dogs need also to have been on a restricted diet long enough to have lost a certain amount of weight. The following procedure, while not essential for every dog, is sufficient to make virtually any dog responsive to dry food pellets:

- (1) Start by giving the dog access to an unlimited quantity of a standard dry dog food once a day. Record the amount eaten each day.
- (2) Weigh the dog at the same time daily, preferably at a time prior to the feeding, and make a chart of the weights.

- (3) When the weight has been stable for approximately 1 week—neither increasing nor decreasing—take the mean for that week as the dog's free-feeding weight. On the dog's weight chart, draw a horizontal line at the free-feeding weight, and another at 90 percent of this weight.
  - (4) Continue feeding once daily, but limit the amount fed to about 1/2 to 3/4 the average amount eaten previously. Supplement the diet with a vitamin-mineral compound. Weigh the dog daily at the same hour as before and record the weights on the weight chart. Also record on the weight chart the amount of food being given each day.
  - (5) Allow at least 1 month for the weight to reach the terminal (90-percent) level; longer, if convenient. When the body weight drops to the 95-percent level, increase the quantity of food by about 20 percent of the previous restricted amount.
  - (6) After the desired 90-percent body weight level has been reached, begin a procedure of making small adjustments in the total food allowance in order to maintain the 90-percent level.
- Reducing a healthy dog's body weight to 90 percent of its *ad lib* weight is well within the safety range. If a dog's performance is poor, there can be further weight reduction. It is suggested that this be done on a day to day basis. That is, if a dog does poorly on a particular day, reduce the daily feeding for that day and see if the motivation level is enhanced on the following day.
- (7) This training program uses Prime™ pellets as rewards. Determine the quantity of the maintenance food that is equivalent to one Prime™ pellet, on the basis of the amounts of the two foods that the food packages specify for dogs of the same weight. Record the quantity of Prime™ given as reinforcement on each day and subtract its equivalent from that day's allowance of the maintenance food.

General health, resistance to disease, and stamina do not seem to be affected by the weight reduction, but exceptional care should be taken in the prevention or prompt treatment of worms. Since worms can consume a considerable portion of the food eaten, and since the dog will have little food stored in its body, a severe infestation of worms could rapidly produce physical trauma. Frequent routine worming and testing for worms is, therefore, even more important than for dogs on unrestricted diets.

For many dogs, this 10-percent weight reduction may not be essential for excellent performance. To determine if a given dog will work as well at an increased weight, bring the weight up gradually, no more than 2 percent per week, by increasing the maintenance diet. Monitor the dog's performance carefully, especially on the more difficult tasks. If a reduction in efficiency or eagerness of search appears, the food allowance should be dropped back to its previous level for several days.

Increasing the dog's weight is hazardous if the dog will later be worked mainly by new handlers. As food becomes less rewarding, petting and praise may maintain good searching and detection as long as the familiar handlers work the dog, but petting and praise from the new handlers may not be effective and the dog's performance may deteriorate.

Maintaining a dog on a restricted diet during the training period serves to make food more rewarding to the dog, even if its overall body weight is returned to normal. Consequently, its body weight can most likely be much more flexible following the training program. The vast majority of dogs trained in this manner continue to work very effectively even on very liberal feeding schedules. The food given while the dog is working is much more desirable, and therefore much more rewarding, than the maintenance food; therefore, the dog will continue to work for the more desirable food.

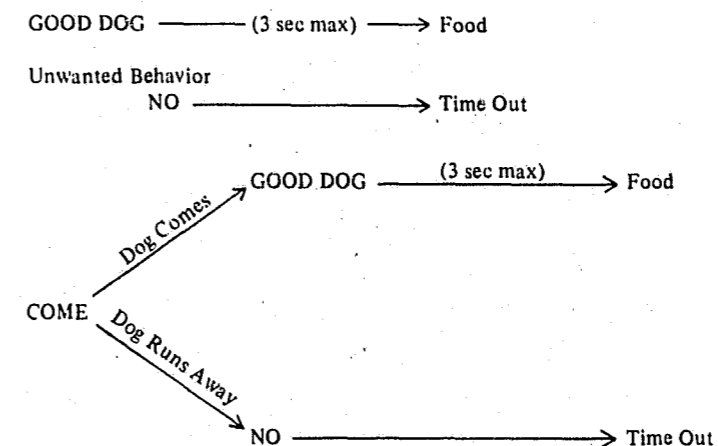
## II. BASIC TRAINING PROCEDURES

### A. Preliminary Training

Once a dog has been selected as a candidate for narcotic detection training, the trainer should become acquainted with the dog. Preliminary training should begin during the "get acquainted" sessions. In the initial training phase, the dog will learn to come to the handler on command. In addition to being taught this behavior, the dog will also be taught the meaning of GOOD DOG and NO. These two commands will become meaningful to the dog through the pairing of these commands with rewards and punishment. Food will be used as the primary reward and isolation (TIME OUT) will be used as the primary punishment.

Initially, the dog should not be required to make any specific response to receive the food reward. All the trainer must do is to be certain that there is a close temporal relationship between the time the trainer says GOOD DOG and presents the food reward. It is essential that the presentation of the food reward come *after* the verbal GOOD DOG. However, the time which elapses between GOOD DOG and the presentation of food should not exceed 3 sec. If the dog engages in some undesirable behavior during this initial training phase, the trainer should say NO and immediately isolate the dog (TIME OUT). It is essential that the verbal command NO be given at the time the unwanted behavior is occurring. This training should continue until the trainer feels the dog is beginning to learn that GOOD DOG means it is about to receive food and NO means it has done something wrong and will be isolated.

The following is a simple diagram of the essential behavioral components presented in this initial training phase.



During all training exercises praise and petting should accompany food as a reward. No praise or petting should be given during the time the dog is being punished.

### B. Initial Olfactory Training

#### 1. Making the Training Odor Rewarding

Once the dog has learned the meaning of the verbal command COME, and the sounds GOOD DOG and NO have been established as secondary reinforcers, the dog is ready to begin the first phase of olfactory training. The goal in this first phase is to establish the training odor hexachloroethane, hereinafter referred to as Hex, as a reward. The dog will begin to salivate and perhaps wag its tail when the odor is presented—the odor becomes a signal that food and praise are to follow. The result of this conditioning procedure is to make reception of the odor rewarding for the animal. During the first phase of training, the dog is not required to do anything to receive the reward. The association between the odor and food and praise will be established simply through repeatedly letting the dog smell the odor and then immediately giving food and praise.

#### 2. Training Procedure

a. *Materials.* The materials used in this phase of training are: (1) six identical screw-top 4-oz. glass jars, each with a 1/4-in. hole in the cap; (2) for each jar, a 1-in.-diameter wooden dowel, 36 in. long, on which to mount the jar; and (3) approximately 1 level teaspoon of the training odor (Hex) for each S+ jar. The following discussion will use the

symbol S+ to refer to the presence of the odor to be detected and S- will refer to the absence of that odor. S- also refers to any odor other than those the dog is trained to detect. These symbols are used in this context throughout this manual.

*h. Preparation.* There are several problems in training a dog to detect odorous materials, one of which is "contamination," i.e., any misplacement of an S+ odor to a place or object that is not intended to be an S+. The various S+ odors must be kept isolated from each other, and no S+ odor should come into contact with any material to which the dog may subsequently be exposed. Extreme care is essential in controlling for contamination, since dogs are capable of detecting incredibly small intensities of many odors. The best rule to follow in controlling contamination is: always handle the S+ odor last, and assume that anything you touch after you have handled the S+ material is contaminated; that is, there is enough of the S+ odor on the handled object for the dog to detect.

Before olfactory training begins, secure a separate place to store each S+ material. This must be a place to which the dog will never be exposed. Any person who handles an S+ material should confine himself to the area designated for that particular S+ until he has thoroughly washed his hands. All materials which are put into the designated area are then considered contaminated and should either be kept in the area, thoroughly cleaned, or destroyed.

During this initial training, one S+ odor (Hex) will be employed. Later, in working with several S+ odors, a separate place to store each of the S+ materials will be needed.

In preparing the S+ and S- stimuli, always handle the S- before the S+ stimuli, never in the reverse order. This is a basic rule and must be observed during all phases of training. Failure to follow this rule is the most frequent cause of contamination. During this initial training phase, it is relatively easy to secure a separate place to store each S+ material and thus help control the problem of contamination. The simplest way to go about preparing the S+ and S- stimuli to be used in Phase I is to attach six identical jars each to a dowel and then load two of the jars with Hex. The same individual should make up both the S+ and S- stimuli; otherwise, there will be different human odors associated with the S+ and S- stimuli.

After coming into contact with any S+ odor, always wash your hands and arms thoroughly before handling any objects with which the dog will subsequently come into contact. In addition, change clothes if convenient.

*c. Training.* The initial olfaction training procedure will consist of two phases. The first phase can, if necessary, be conducted by one person. The second phase can be much more efficiently run with two persons.

The mechanics of this procedure are straightforward. During Phase I the dog should be tethered and the S+ and S- stimuli brought one at a time to the dog from where all stimuli are kept, approximately 10 to 15 ft away from the dog. A single trial consists of placing either the S+ or S- stimulus under the dog's nose. As the dog breathes, it will receive the S+ or S- odor. On S+ trials the jar is placed under the dog's nose, and the handler then says GOOD DOG and feeds and pets the dog. On S- trials the jar is simply removed. There is no food or petting given on these S- trials.

Following presentation of S+ and reinforcement or removal of S-, the handler turns, moves to the place where the S+ and S- stimuli are kept, and obtains the appropriate stimulus for the next trial. If an additional person is available, he can tell the handler whether the trial is an S+ or an S- trial and can record each trial on a data sheet. Otherwise, the handler himself should note the condition for the next trial and mark the data sheet.

The schedule of S+ and S- presentations during Phase I is one of a random alteration with progressively fewer S+ in relation to S- presentations. The schedule begins with a ratio of two S+ stimuli for each S- and progresses through a ratio of 10 S- stimuli for each S+.

There are four blocks of trials at each ratio. This schedule results in 44 reinforcements in 197 trials. Broken down, the number of reinforcements and number of trials at each ratio are as follows.

No. of S+	No. of S-	No. of Trials	Ratio
8	4	12	2-1
4	4	8	1-1
4	8	12	1-2
4	16	20	1-4
4	20	24	1-5
4	24	28	1-6
4	28	32	1-7
4	32	36	1-8
4	36	40	1-9
44	152	196	

Data sheets Nos. 1 and 2 are shown on the following pages, one of which (No. 1) has been filled in and can be used as the schedule to follow. The trials in Phase I can be given in 1 day or can be spread over 2 days. It is suggested that, if half the trials are given on each of two separate days, on the first day the ratios 2:1 through 1:4 should be conducted and on the second day the ratio 1:4 should be repeated, followed by the progression through 1:9.

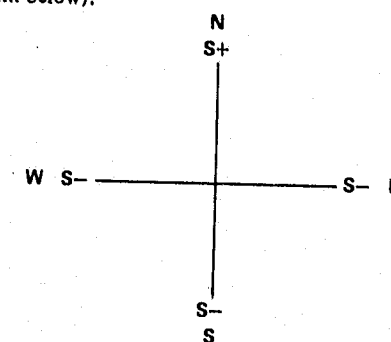
The procedure in Phase II is almost identical to that of Phase I; the only difference is that instead of bringing the S+ or S- jar and dowel to the dog, as was the case in Phase I, the handler walks the dog to the dowel and jar assembly, which is held horizontally by a second person. During Phase II the person not handling the dog will change the S+ and S- stimuli, keep the data sheet, and inform the handler of the condition of each trial. The same schedule is followed in Phase II as was followed in Phase I.

### 3. Data Sheets

The data sheets should be made out before beginning the training session and should follow the general format of the sample data sheets. The schedule of reinforcements proceeds across the page from left to right, going from one ratio to the next. A plus (+) in a column means that on that trial an S+ stimulus should be presented to the dog and the dog should be rewarded. A minus (-) in a column means that an S- stimulus should be presented and the dog should not be rewarded. As each trial is completed, it should be checked off in the box below the (+) or (-) designations. In this way, one can be sure that he completes the training according to the schedule. The complete schedule is shown in the sample data sheets on the following pages and in Appendix A. A partially completed data sheet is shown in the first sample sheet. As can be seen, forty trials have been run. The dog has received 19 (+) trials on which it received food and praise and 21 (-) trials where there was no reward. The schedule given here should be used in both Phase I and Phase II.

### C. Simple Discrimination Training

Once Phases I and II of initial olfactory training have been completed, four-choice discrimination training should begin. Discrimination training means training in which the dog will be required to make a distinction between the S+ and S- stimuli. During this phase, the dog will learn to sniff the jars and to sit when it sniffs the S+ jar. To insure control of the dog's movements, this phase of training may be conducted with the dog on-leash. This training can be conducted inside a building or, if there are no strong wind currents, it can be conducted outside. The materials used in this training will be three S- jars and one S+ jar, identical to those used in initial olfactory training. These jars are placed in four positions: north, west, south, and east (see diagram below).



This diagram represents the physical plan used to conduct four-choice discrimination training. The S+ jar begins in the north (N) position and the S- jars in the west, south, and east positions.

There should be approximately 8 ft between the jar in the N position and the jar in the S position, and a like distance between the jars in the E and W positions. The positions of the S+ and S- stimuli are changed on each trial. Thus, if the S+ is in the N position on one trial, it will be changed to another position on the subsequent trial. This training should be continued until the dog reliably sits after it sniffs the S+ jar and does not make a sit response to the S- jars.

#### 1. Initial Discrimination Training

In the initial discrimination training trials, the dog will only be required to sniff the S+ jar to get the reward. Timing is very important here. At the instant the dog sniffs the S+ jar, the handler immediately says GOOD DOG and gives the dog the food reward. The training should begin with only the S+ jar for a few trials. As soon as the dog has learned to sniff the S+ jar, one S- jar should be added. Then, after the dog has received several trials with the two stimuli, add the third and fourth jars.

After the dog has been run through several trials in the four-choice discrimination task, it will begin to alert after it sniffs the S+ jar. Once this alerting behavior is noticeable, the sit response to the S+ stimuli should be added.

When the dog sniffs the S+ jar, the handler says GOOD DOG and, at the same time, gently pushes down on the dog's hips with his left hand; with the right hand, he puts the food in the dog's mouth and gently pushes the dog's nose and mouth backward.

# DATA SHEETS - INITIAL OLFACTORY TRAINING

Experiment: \_\_\_\_\_ SCHEDULE: ASSOCIATION OF S+ WITH REWARD

Trainer (s): \_\_\_\_\_

Date (s): \_\_\_\_\_

Dog: \_\_\_\_\_

Notes:

Ratio S+ S													
2 - 1	+	+	+	+	-	+	-	+	+	-	+	+	
1 - 1	+	-	+	-	-	+	-	+	-	+			
1 - 2	-	+	-	+	-	-	-	+	-	+	-		
1 - 3	-	+	-	-	+	-	-	-	-	-	+		
	-	-	-	+									
1 - 4	-	-	+	-	-	+	-	-	-	-			
	-	+	-	-	-	-	-	-	+	-			
1 - 5	+	-	-	-	-	-	-	-	+	-	-	-	
	-	-	-	-	+	-	-	+	-	-	-	-	
1 - 6	-	-	+	-	-	-	-	-	+	-	-	-	

Data Sheet No. 1

Experiment: \_\_\_\_\_

E(s): \_\_\_\_\_

Date(s): \_\_\_\_\_

Time(s): \_\_\_\_\_

Notes:

Ratio S+ - S - (continued)													
1 - 6	-	+	-	-	-	-	-	+	-	-	-	-	
	-	-											
1 - 7	-	-	-	-	-	-	+	-	-	-	+		
	-	-	-	-	-	+	-	-					
1 - 8	-	-	-	-	-	-	-	+	-	-			
	-	+	-	-	-	-	-	-	-	-	-	-	
	+	-	-										
1 - 9	+	-	-	-	-	-	-	-	-	-	-	-	
	+	-	-	-	-	-	-	-	-	-	+	-	
	-	-	-	-	-	-	-	+	-	-	-	-	
	-	-	-	-	-	-	-	+	-	-	-	-	
	-	-											
	-	-											

Data Sheet No. 2

After a few trials, the physical cues should gradually be reduced until the dog is sitting to the S+ without being prompted by the handler in any way.

There are responses other than the sit response which can be used by the dog to indicate the presence of contraband. A dog can be trained to paw the object in which contraband is hidden. Other responses such as barking or attacking could also be used to indicate the presence of contraband. However, it would appear that the advantages of the sit response outweigh the disadvantages more than any of these alternate responses. One advantage is the relative ease in teaching the dog this response; many dogs learn this response in only a couple of sessions.

Another major advantage of the sit response is that it does not encourage the dog to come into physical contact with the narcotic materials used during training. This eliminates the possibility of the dog ingesting these materials. If the dog comes into physical contact with the materials, there may be undesirable physiological reactions. Also, training aids could not be reused after the dog had come into physical contact with the material, because the sample would then have the odor of the dog and the dog would learn to search for this odor instead of the odor of the contraband material.

In addition, the dog is learning the odor discrimination at the same time it is learning the sit response; thus no additional training time is spent in shaping the response. It would appear that the only disadvantage of this response would be in situations in which it would be difficult or impossible for the dog to physically sit such as working in an automobile or other confined area. It is felt that, in such situations, the handler can easily "read the alert" of the dog.

No two dogs will learn at the same rate; thus all training must be programmed to suit each individual dog. The entire training program is based on the gradual assimilation of new behaviors which can only be learned if the dog has mastered the previous task. If a dog is slow in learning a particular task, it is essential that it be given additional practice at this task before it is introduced to the next training task. If a dog is pushed into new learning situations before it has mastered a more elementary one, it probably will not be able to learn the new task. Do not make the mistake of rushing the dog. Be certain it has mastered one task before moving to the next. Anytime the dog is performing poorly, it is essential to revert to a simpler task; once it is performing well, gradually progress to the more complex task. If the dog continues to perform poorly on the simpler task, training should be temporarily discontinued until the cause of the problem can be determined and a solution found.

a. *Search Command.* It is desirable to have the dog search on command. Upon entering the area to be searched, the dog should be given the command SEARCH.

There will be times when the dog will be required to search some particular area or object within the general area being searched. In these instances, the handler should move to the area or object, get the dog's attention, indicate the object by moving his fingers to the object, and give the search command.

To insure the dog's prompt response to the search command, some rather careful training will have to be given. This training should begin as early as possible, preferably during the first stages of the four-choice discrimination task. The dog must learn that when an area or object is indicated and the search command is given, it is more likely to detect an S+ odor than if it ignores the command. In order to establish and maintain this "search-find-reward" association, systematic conditioning of this association throughout training is necessary.

Establishing the association between the verbal command SEARCH and the increased likelihood of finding an S+ during the initial trials of the four-choice discrimination task will facilitate more rapid learning of the discrimination task, and, in addition, will establish the search command as a signal for the dog to search more vigorously.

In order for the dog to learn to search more vigorously when the search command is given, the handler will have to give the dog the command just prior to making a detection. Begin by giving the command prior to the detection of the S+ on every trial. After several trials in which the search command is given on every trial, the command is then given on progressively fewer trials. The ratio schedule followed in initial olfactory training is a good schedule to follow in programming the trials on which the dog receives the search command.

In following this schedule, the dog should be given the search command just prior to S+ detection on each trial where there is a (+) recorded. On trials where there is a (-) recorded, the dog receives no verbal command. As the schedule indicates, the search command is given on trials 1, 2, 4, 6, 8, 9, 11, 12, and so forth. Following this schedule results in fewer and fewer trials in which the search command is given.

If the search command were given just before the dog sniffs the S+, and at no other time, the dog would soon learn that any time it hears the search command and sits, it will be rewarded. To insure that this behavior does not develop, the search command should be given just before the dog sniffs the S- stimuli on some trials. The percentage of times it is given to S- should be increased gradually.

The systematic presentation of the command SEARCH outlined above will result in the dog's learning to search more vigorously when the search command is given, but the dog will continue to rely on the sense of smell in making the distinction between S+ and S-.

b. *False Sits.* There will be occasions when the dog will sit where there is no S+ present. This is an error which is referred to in this manual as a "false sit." In the four-choice situations there are three S- jars and one S+ jar. If the dog sits to one of the S- jars this is a false sit.

The question is, What do you do if the dog sits to one of the S- stimuli? While there are various possible ways to deal with this type of error, the best, overall, is to give the conditioned negative reinforcer NO followed by removing the dog from the vicinity of the S+ and S- stimuli. For example, if during discrimination training in the two, three, or four-choice discrimination task, the dog approaches, sniffs the S-, and sits, the handler should say NO in a normal tone and take the dog back to the starting position. Do not pet or otherwise praise the dog until it has made a correct response. In most cases, this correction procedure will suffice to eliminate false sits. If the dog continues to make false sits in this situation, it is most likely that it has not made the association between the odor and the sit response. If the association between the S+ odor and the sit response apparently has not been made, revert back to giving praise and food without requiring the dog to sit. That is, when the dog starts to make systematic or frequent errors, return to a more elementary stage of training and work back up to the point where the desired behavior started to break down. Do not wait until the undesired behavior has become chronic before backing up. Always back up enough to insure that the dog will respond successfully; then, after a period of correct responding at the more elementary level, continue to move gradually toward the desired goal.

## 2. Six-Choice Discrimination Training

Once a dog has learned the four-choice discrimination task (100 percent correct responses for at least one entire session), the next step in training is the standard six-choice discrimination task.

The apparatus is shown in Figure 1. It should be set up in an inclosed area where there are no noticeable wind currents. Two trainers are necessary to conduct six-choice discrimination sessions, a programmer and a handler. The programmer will change the S+ and S- stimuli and keep the data. The handler will handle the dog and administer rewards for correct responses.

There are six phases of training which should be completed with the training odor (Hex) in the six-choice discrimination task before any attempt is made to work with narcotic odors. The six phases are as follows:

- (1) Acclimation.
- (2) S- odors added to empty jars.
- (3) Delay in reward training.
  - (a) Primary (food).
  - (b) Secondary (praise).
  - (c) Primary and secondary (food and praise).
- (4) Handler's knowledge of the position of the S+ eliminated.
- (5) Off-leash training.
- (6) Sensitivity training.

These steps should be taken one at a time and performance should approximate a 100 percent correct response at each step before the next step is taken.

*Step 1. Acclimation.* Acclimation bridges the gap from simple four-choice discrimination to the new apparatus and procedure. Two adjoining rooms should be used. One room will house the apparatus and the second room will be used to keep the dog between trials. The dog is run on-leash in the first four steps of training and off-leash during the last two steps.

The handler will bring the dog into the room and give the search command. He will then lead the dog to the six jars. Before the dog examines the jars, the programmer will tell the handler which position the S+ occupies on each trial. This is done so that reward or correction can be given immediately after the responses.

*Correct Response.* If the dog comes into the room, sniffs the jars, does not sit to the S- jars, and sits to the S+ jar, it should receive food, petting, and praise and then should be taken from the room to await the next trial.

*Incorrect Responses.* If the dog sits to one of the S- stimuli, this is an incorrect response and terminates the trial. If the dog sniffs one of the S- stimuli and starts to sit, the handler should say NO and immediately remove the dog from the room. There should be no food or praise given until the dog makes a correct response on a subsequent trial. The above kind of error is a false sit.

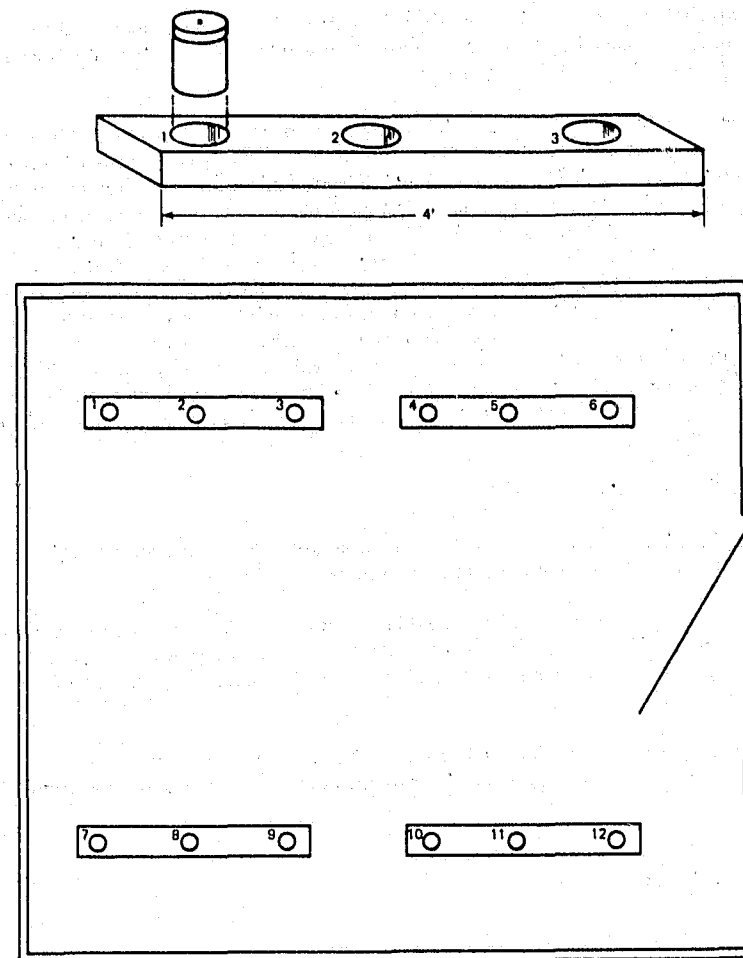


Figure 1. Apparatus for Six-Choice Discrimination Training. The enclosed area represents a room in which there are four 4-ft 2 x 4's. Three holes, large enough that the 4-oz jars fit into them easily, are bored about 22 in. apart in each board, and are numbered 1 through 12. In the diagram there are jars in holes Nos. 2, 3, 5, 8, 10, and 12. There is always one S+ jar and five S- jars present on each trial.

Another type error is a failure to sit when the S+ stimuli has been sampled. There is no correction for this error. The dog is simply redirected to all stimuli.

If either of these errors persist, revert to an easier task. In this case, if the dog continues to make errors, revert to the procedure used to establish the sit response to the S+ jar in the four-choice situation, except continue to use the six-choice discrimination apparatus.

The programmer will move the S+ and S- stimuli to new positions on each trial. He will tell the handler the new position of the S+ on each trial and keep the data sheets.

In addition to the dog's becoming familiar with the new apparatus, this initial training step will allow both the handler and programmer to become familiar with the procedure and the data collecting.

**Step 2. Introduction of S- Odors.** Once the dog can discriminate the S+ from the five empty jars, other odorous materials should be put into the empty jars. The purpose here is to insure that the dog is not simply responding to "something versus nothing" but that it is discriminating the odor of the S+ from other odors. Any foreign odor can be used as an S- odor, and the more different S- odors introduced into training the better. Any material which has been or will be systematically associated with the S+ stimuli must be included. For example, any packaging material used with the S+ odor should be included as S- material. The operational procedure is the same as in Step 1. A record should be kept of any S- odors to which false sits are made.

**Step 3. Delay of Reward Training.** Up to this point, the person who handled the dog has known the position of the S+ prior to the dog's response. Knowledge of which jar contained the S+ odor insured that the handler could present the reinforcement at precisely the correct time. That is, the handler could say GOOD DOG, and administer the food reward or say NO and remove the dog immediately after the dog's response. This timing was essential for rapid learning during the early stages of training. The dog must, however, learn to tolerate short delays in reinforcement, as later in training there will necessarily be times when immediate reinforcement is not feasible. Unless the dog has had some exposure to such delays in reinforcement, an unexpected delay could disrupt the dog's behavior.

There are three phases in this training step. Phase A introduces a delay between the time the handler says GOOD DOG and the time he gives food. Phase B introduces a delay between the time when the dog sits and the time the handler says GOOD DOG. Phase C is a combination of both these delays on a single trial. Although the length of delay in reinforcement may be extended later in training, a moderate delay (up to 5 sec) should be sufficient at this stage of training. Each delay should be built up gradually beginning with no delay.

**Step 4. Elimination of the Handler's Knowledge of Position of S+.** Under most training conditions, the handler should not know the position of the S+ stimuli. The reason for this is that a handler who knows where the S+ is cannot avoid giving cues to the dog, even though he may be unaware of doing this. It can be assumed that if he does not know where the S+ is located, he cannot cue the dog to the S+. Therefore, during this training step the handler will no longer know the position of the S+ until after the dog has made a response. The dog is brought into the room and is guided to the jars in the same manner as in prior steps. When the dog responds, the programmer will quietly say YES to the handler if the dog has responded correctly and NO if the dog has responded incorrectly. The handler will then reward for correct responses in the usual manner.

**Step 5. Off-Leash Training.** The dog should be trained to work on-leash and off-leash. Once the dog is working well on-leash with a handler who does not know the position of the S+ samples in the six-choice discrimination task, a series of trials with the dog off-leash should be run. If the dog has been working well on-leash, there should be no difficulty in working it off-leash. The dog's search pattern can be directed by pointing to a particular object and by verbally encouraging it to search. The handler should not know the position of the S+ during the off-leash training.

**Step 6. Sensitivity Training.** Hex is an intense odor and can very easily be detected. In order for the dog to detect weaker odors, it will need to sniff in the most effective way and to attend to very faint odors. This is the reason why, before working with the narcotic odors, the dog should be trained to respond to low concentrations of the training odor in the six-choice discrimination task. When the dog has mastered the discrimination task with a 3/8-in.-hole in the top of the S+ jar, the hole should be made smaller and smaller. The recommended sequence is 1/4, 3/16, 1/8, 3/32, and 1/16 in., and a No. 60 drill size. Once the dog has learned to detect even the faintest amount of an S+, there is less chance that difficulties will arise in training it to search larger areas for the S+.

The jars which are used during this discrimination training should be changed frequently. Once the odor concentration is reduced to very small amounts, special care must be taken to insure that the dog is, in fact, responding to the Hex odor and not to some extraneous variable.

For this reason, all bottles and training aids should be thoroughly cleaned or destroyed after each day's session. Each dog should be run with fresh training aids. It is also advisable to task the dog to a completely new set of S+ and S- stimuli during the latter stages of each session.

### 3. Performance Records for Discrimination Training

It is *essential* to keep records of the dog's daily performance during discrimination training for use in planning the next day's training session. If several dogs are being trained, it is difficult to recall the details of each dog's performance. Every dog will have individual strong and weak points, and these must be considered in planning its work schedule.

Graphical presentation of the records, for example, graphing the daily percentage of detections throughout training is not necessary. Such graphs contain very little meaningful information, for this reason: the recorded level of performance depends largely upon the intensity of the odors that are being used, but the selection of the odor intensities to use at any time depends upon the trainer's judgments as to the dog's current performance. The principal use of the daily records is to aid in planning the next day's training, not to evaluate the progress of the dog. They also indicate any tendency of the programmer to place the S+ in certain locations too frequently, or to favor certain changes in location from one trial to the next. If desired, the locations can be listed in advance, to assure that the locations are at least semi-random.

A sample data sheet used in six-choice discrimination training is shown on the following page. The symbols used in keeping these data sheets are: S+, S-, +, -, and 0. The number in the location column represents the location of the S+ stimulus in the room. Response to the S+ odor is recorded in the column labeled S+. A plus (+) in this column means that the dog sniffed the S+ odor and sat down beside it. A minus (-) in the S+ column means that the dog sniffed the S+ odor and did not sit but moved on. A zero (0) in the S+ column means that the dog did not approach the S+ odor at all. The five columns labeled S- are the spaces to record responses to S-. The correct response, i.e., sniffing the S-

**DATA SHEET—SIX-CHOICE DISCRIMINATION TRAINING**

**Six-choice Discrimination Training: Hex: 1/16" hole**

Dog: \_\_\_\_\_ Handler: \_\_\_\_\_ Programmer: \_\_\_\_\_

Date. \_\_\_\_\_

[illegible]

## NOTES:

Data Sheet No. 1

odor jar and moving on, would be recorded by placing a minus in the S- column. The location of S- odor jars need not be recorded unless the dog sits to an S- jar. When this occurs, the trial terminates and a plus is recorded in the S+ column along with the position number of the hole where the S- jar is located. An asterisk (\*) in the S- column is used to indicate that the dog was cued by the handler for some reason. An explanation such as the one on the sample data sheet (Trial 5) should be indicated.

Trial 7 shows a plus in the S+ column and two minuses under the S- group. This indicates that the dog attended two S- jars before going to the S+ odor. The correct response to an S+ odor terminated Trial 7 at that point. The record for Trial 1 on the data sheet shows that the dog sniffed the S+ odor and moved on without sitting. It then sniffed an S- jar and sat down. An incorrect response to an S- ends the trial. The data recorded for Trial 2 shows that the dog did not approach the S+ odor (0 in the S+ column). The dog did attend two S- jars and sat to the second S- jar, thus ending the trial. In Trials 3 and 4 the dog attended all five of the S- jars and then came to the S+ jar to which it responded correctly.

#### D. Basic Room Search

To have much practical value, the dog must not only learn to discriminate S+ odors, it must also learn to search an area actively and to locate narcotic materials if they are present. After the dog has learned to discriminate Hex and either marijuana, hashish, or opium in the six-choice situation, room search training should begin.

During room search training, the handler should rarely know the location of any S+ samples. Consequently, it will always take at least two people (a programmer and a handler) to run room search trials. The programmer will hide the plants, give directions to the handler and keep the records; the handler will work the dog. If the handler knows where the S+ has been planted, he will almost certainly cue the dog, even though he is deliberately trying not to do so. Therefore, it is essential that the handler not know the position of the S+ during room search training. There will be times, however, when the dog should be directed during room search training. The handler can direct the dog to search a certain specific area or a particular object if he thinks the area may contain likely hiding places, but he runs a great risk of unconsciously cuing the dog if the location of the S+ stimuli is actually known. After the dog sits, the programmer will give the signal YES (correct) or NO (incorrect) and the handler will reinforce the dog accordingly.

Begin room search in a relatively small uncluttered room. On the first trial, an S+ jar and two S- jars should be placed in very obvious places where the dog will be able to see them. These initial trials may be run with the dog on or off-leash. The reinforcement contingencies are the same in room search training as in the six-choice situation—immediate reinforcement when the dog sits. That is, give food and praise if the dog is correct or NO and removal from the room if it is incorrect. The programmer will know which jar contains the S+ on these trials and will signal the handler immediately following the dog's response. The location of the S+ and S- samples should be moved by the programmer on each trial. Once the dog is responding reliably to the easily located S+ jars, the task should be made more difficult by planting the S+ jars in less obvious places in the room. This should be done gradually so the dog will have to work just a little harder on each trial. After the dog has learned that it has to move around the room and sample several S- jars in order to locate the S+ jar, then partly hide the S+ and S- jars, i.e., have only a small part of each jar visible. For example, the jars may be placed in open boxes which are scattered around the room.

Continue to reduce the visual cue until the jar is completely out of sight. The dog must then rely completely on the sense of smell to locate the S+ odor. Once this is done, the proportion of the jars that are S- can be reduced to approximately one-fourth.

As with all other procedures in this manual, any time the behavior of the dog becomes disrupted, go back to a task the dog has previously learned. Reinstate the desired behavior and then gradually move to the new task.

After the dog has learned to sample a limited area with the S+ hidden from sight, training should move to a larger area which contains more objects. As with all phases of training, always program in small steps and be sure the dog has learned one task well before taking the next step. If the progression to a more difficult task indicates that the dog is not performing well, do not continue to run the dog in this situation. Go back to a task in which the dog has done well and then gradually move toward the more difficult task.

Once the dog is responding well in one room with several objects, additional rooms should be incorporated into the dog's search pattern. During the initial room search training, there should always be at least one S+ in every room. The number of rooms to be searched should be increased gradually. Once the dog is performing well in the multi-room situation, some S- rooms should be introduced, that is, there should be some rooms in which there has been no S+ planted. The handler should not be told in advance whether a room he is about to search is an S+ room or an S- room.

It is not essential that the dog detect every S+ which has been planted. However, as fewer rooms come to have an S+ planted in them, and as larger rooms are used, care must be taken not to require the dog to search too many and too large rooms without detecting an S+. If area search per detection increases too rapidly, the search behavior may deteriorate. Progress slowly in increasing room size or decreasing the number of S+ rooms.

## 1. Recording of Performance

The data sheet on the following page represents a record of the performance which might be expected from a dog with limited multi-room search training in the detection of Hex, marijuana, and hashish. The analysis of the data sheet is also presented to illustrate some of the conditions which will likely be experienced during this stage of training. In addition, the analysis should further illustrate an efficient method of keeping a record of the dog's performance.

The data sheet for room search should have spaces to record the trial number, room number, whether the room contains an S+, the type of S+, if any, and it should have columns for recording the dog's performance. The sheet should be labeled with information regarding the purpose of the training session, the place, the date, the name of the dog, and the names of the handler and programmer.

The dog's performance in each room and the time spent in each room should be recorded for each trial. A plus (+) recorded in the column headed condition (cond.) indicates that the room contains an S+. A minus (-) in the condition column indicates that there is not an S+ in the room. If the room contains an S+, an initial identifying the type of S+ should be put beside the + in the condition column. Thus, + Hex for Trial 1 indicates that Hex is planted in that room. If the dog detects the Hex and sits, a plus should be recorded in the Hex column. In Trial 3, the S+ is marijuana; therefore, an MJ is recorded. The data for Trial 4 indicates that MJ was planted in Room 6 but the dog did not detect it. The minus in the MJ column for Trial 4 shows that the dog approached the marijuana but did not sit. On Trial 5, the dog sat in an S- room. This is recorded by placing a plus in the column headed S-. Trial 6 shows that hashish (Hash) was planted in Room 5 and was detected.

As can be seen from the times recorded for the other rooms, the dog was kept in Room 5 for a longer period than in any of the other rooms. Although a dog should examine a room carefully, it should not be retained in a room for longer than necessary to complete the room search. If there is an S+ in the room, the dog will likely detect it in a relatively short period of time. As Trial 5 illustrates, if the dog has searched a room, retained there, and made to search the same area repeatedly, the possibility of false sitting is increased. As different dogs are trained, the trainer becomes aware of their individual capabilities and will learn the speed at which a particular area can be searched most effectively.

There are two components to good search strategy: (1) percent detection, and (2) speed at which the dog searches an area. Ultimately, the dog must search an area as quickly as possible and make a high percentage of detections. If the dog does not sit in an S- room, the programmer need only record the time spent in the room. Trial numbers are marked to show the order in which the rooms are to be searched. The programmer plants the S+ materials, prepares the data sheet, directs the handler to the rooms according to the order outlined on the data sheet, and records the dog's performance.

Note that the schedule gets progressively leaner (fewer S+ rooms) as the session continues.

If at any time during the session the dog is cued, i.e., led to the odor, this should be recorded as such by placing an asterisk and explanatory comment for the trial. The data for Trial 7 show that the dog responded incorrectly but was prompted to do so by the handler. The recording of Trial 11 differs from that of Trial 7, but it is still an example of cueing. On Trial 11 the dog spent 40 sec in the room without detecting the S+ and the handler was instructed to direct the dog to that area. The asterisk and explanatory notes were again used to indicate that the dog was cued.

After the entire training session has been completed, a brief summary of the dog's performance should be recorded. Any special problems or unusual behaviors should be included. A brief statement of what would be desirable in the next training session should be made.

## 2. Transition from Discrimination Task to Room Search with the First Narcotic

There should be very little difficulty in progressing from the six-choice discrimination task to room search with the addition of a narcotic odor. The dog has already learned to do room search for one type S+, and the search pattern is basically the same regardless of which S+ is in the area.

The dog should display nearly perfect performance on the six-choice discrimination task before the new S+ is included in the room search sessions.

When the first narcotic agent is included in room search sessions, Hex samples should also be hidden in each room, and the number of narcotic samples initially hidden in each room should be double that of the Hex samples. On subsequent sessions the number of the Hex plants should be decreased gradually. The rate at which the Hex plants can be decreased will depend on how quickly the dog learns to respond to the narcotic plants.

If the dog fails to detect most of the narcotic samples on these initial sessions, they should be made easier to detect; once the dog begins to detect most of them, they can be gradually made more difficult to detect.

**DATA SHEET—ROOM SEARCH**

ROOM-SEARCH \_\_\_\_\_ PLACE:

Dog: \_\_\_\_\_ Handler: \_\_\_\_\_ Programmer: \_\_\_\_\_  
Date: \_\_\_\_\_ Time(s): \_\_\_\_\_

**Notes:**

[illegible]**Data Sheet No, 1**

### III. ADVANCED TRAINING PROCEDURES

#### A. Discrimination Training with Narcotics

##### 1. Transition from Training Odor to Narcotic Odor

After the dog has progressed through the six training stages just described, it is ready to begin discrimination training to various narcotic odors. Before proceeding with this section, refer to Appendices B and C on Maintenance of Heroin and Cocaine and Preparing and Maintaining Samples. Prior to the beginning of training to any narcotic odor, it is best to determine each type of narcotic the dog will be expected to detect. Narcotics vary tremendously in the amount of odor they emit. That is, some narcotics, such as marijuana and hashish, have very strong odors, whereas others, such as heroin and cocaine, give off very little odor. In fact, heroin and cocaine are considered odorless to humans. Although the correlation between human and canine olfactory sensitivity to various substances has not been investigated, it may be assumed that, in general, what has a strong odor to humans also has a strong odor to dogs; a material which has a weak or nonexistent odor to humans is unlikely to have a strong odor for dogs.

For the purpose of this manual, the following narcotics will be considered:

- (1) Marijuana—"MJ"
- (2) Hashish—"Hash"
- (3) Opium—"O"
- (4) Cocaine—"C"
- (5) Heroin—"H"

The first three narcotics included in this list (marijuana, hashish, and opium) are all odorous to humans and are readily detected by dogs. Heroin and cocaine in pure form, on the other hand, are virtually odorless to humans and are relatively difficult for dogs to detect.

In training a dog to detect any combination of these narcotics, the training should be given in the same sequence as the narcotics are listed. That is, train the dog first to detect marijuana, then hashish, then opium, (and finally) cocaine and heroin. It is not necessary to train the dog to detect all the narcotic agents on the list, nor to confine the training to the specific narcotics listed here. *Regardless of which narcotics are used, the training should be given with the least odorous narcotics last.*

##### 2. Training Procedure with the First Narcotic

After completing the six steps outlined in the section on six-choice discrimination training, the dog should be ready for training to the first narcotic odor (begin with the most odorous narcotic to which the dog will be trained). The procedure presented here for training the dog to respond to an additional odor is relatively simple and has been demonstrated to be fast and effective. The same six-choice discrimination procedure previously used with Hex will be used to train the dog to new odors. The technique for transferring to the new S+ odor is as follows:

- (1) Begin the session with a few trials using the training odor; this will assure that the dog is working well on the six-choice discrimination task.
- (2) Once the dog is working well, remove the jar containing the training odor and put the new S+ jar, which contains a generous quantity of the narcotic, in its place.
- (3) On the first trial with the new S+, the dog is brought in and will begin to sniff each of the jars, just as it has previously done. At the precise instant the dog sniffs the new S+ jar, the handler should immediately say GOOD DOG and feed the dog. Initially, the programmer will tell the handler the position of the S+ prior to the beginning of the trial. The dog is likely to sit when the handler says GOOD DOG; if the dog fails to sit, it should be fed and gently placed in the sitting position in the same manner as was done in initial sit training. Gradually demand more and more from the dog. Give the dog time to sit without being coaxed or physically assisted. Once the dog begins to sit on its own, delay saying GOOD DOG for a second or two, thus giving the dog a chance to sit before reinforcement is given.

The rate at which the dog learns to respond to the new S+ odor depends largely on how well the handler times his responses. If his timing is poor, the dog will take a much longer time to learn to respond to the new odor. The most essential aspect of this transfer procedure is that the verbal cue (GOOD DOG) comes at the exact time the dog sniffs the new S+ jar. *If the timing is good, it will take only a few trials for the dog to begin to associate the new odor with food and praise.* Once the dog has learned this association, progress through all the steps in six-choice discrimination training with the new odor. This should not take as long as it did with the training odor.

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As with all other procedures in this manual, any time the behavior of the dog becomes disrupted, go back to a task the dog has previously learned. Reinstate the desired behavior and then gradually move to the new task. If during the initial trials with the new S+ the dog begins to make frequent errors or quits sniffing the jars, go back to using the training odor until a reliable response is re-established, then reinstate the new S+ and continue the procedure until the dog reliably responds to the new odor.

### 3. Additional Narcotic Odors

The same methods that were described for training the dog to discriminate and search for marijuana should be used in training the dog to respond to each subsequent narcotic. It should be emphasized that the dog must be well trained to all previous S+ odors before an attempt is made to add an additional odor. That is, the dog should have nearly perfect performance in the six-choice discrimination task and should be performing well in room search with every previously conditioned S+ odor is added.

It has already been pointed out that detection training with marijuana, hashish, and/or opium should be well established before any attempt is made to train the dog to respond to either cocaine or heroin.

All the rules pertinent to training the dog to detect marijuana, opium, and hashish also apply to training the dog to detect heroin and cocaine. However, there are several other considerations which must be made when working with heroin and cocaine. These special considerations include more refined training techniques and additional special equipment. Before cocaine and/or heroin detection training is begun, the dog should be well trained in odor discrimination and limited room search with at least one additional odor. All of the special equipment should be set up and working properly.

### B. Discrimination Training with Aspirin, Acetic Acid, and the Diluents Mannitol, Lactose, and Quinine

Once a reliable response to H has been established, further discrimination work with various S- substances should be carried out. The following is a list of the materials to which the dog should be tasked to discriminate prior to beginning room search exercises with H:

- (1) Glacial acetic acid: mixtures of 1/10, 1/100, 1/1000, and 1/10,000 with water should be used.
- (2) Common aspirin: several brands should be used. Aspirin should be pulverized before packaging into samples.
- (3) In addition to aspirin and acetic acid, both of which may have an odor similar to H, the diluents commonly used in cutting H should also be used in controlled laboratory test. The more common diluents used to cut H are: mannitol, lactose, and quinine. One common diluent used with cocaine is procaine.

#### 1. Preparation of S+ and S- samples

S+ samples should be prepared in the same manner as was described in the section on preparation and maintenance of training samples. The S- samples should be prepared in the same way as the S+ samples. The same person should prepare both groups of samples. The rule is that both S+ and S- samples are identical except that the former contains a certain quantity of H and the S- sample contains an identical amount of one of the three diluents, aspirin, or a small quantity of a solution of acetic acid and water. Although the dog can be exposed to more than one type S- in a single session, it is better to introduce only one type at each session.

#### 2. Discrimination Training

The procedure is the same for introducing each of these S- substances, therefore only one (aspirin) will be discussed in detail here. At least two sets of samples (2 H and 2 aspirin) should be used with each dog during each daily session. The following is a step by step progression of how each of these S- substances should be introduced to the dog:

- (1) Trials 1-10—S+ H in plastic bag in pasteboard box  
S- empty plastic bag in pasteboard box.

- (2) Trial 11—S+ H in plastic bag in pasteboard box  
S- aspirin in plastic bag in pasteboard box.

If the dog does not positively respond to the aspirin, continue to run the dog on these samples until Trial 25.

- (3) Trial 25—Introduce new samples. If the dog continues to respond correctly, you may assume that the dog has learned to ignore the aspirin odor.

If the dog responds positively to the aspirin during the initial training trials (Trials 1-11) it should be corrected by the verbal command NO. Continue to correct the dog by the verbal command NO until the dog responds

positively to the H and does not respond to the aspirin. Once the dog can reliably respond to H and ignore the aspirin, introduce the fresh samples. If the dog does not make errors on the new samples, you may assume the dog has learned to discriminate between the H and the aspirin odor. If the dog performs well on one set of samples and does poorly on another set, you should prepare several sets of new samples and continue training until the dog can reliably discriminate H and aspirin.

Once the dog has learned to discriminate aspirin, each of the other S- substances should be introduced. The same procedure used with aspirin should be used with the acetic acid, mannitol, lactose, and quinine.

### 3. Training with Diluents

A good H/C detector dog should respond to both pure H and H after it has been cut with other substances. The most common diluents used with H are mannitol, lactose, and quinine. The most common diluent used with cocaine is procaine. The following is a step by step procedure which can be used in training the dog to respond to H or C mixed with a diluent. The procedure presented here uses H and mannitol as an example of how to train a dog to respond to the H or C plus the diluent and to ignore the diluent in pure form. The exact same steps can be used with any diluent.

- (1) Prepare S- samples: a quantity of each of the diluents, equal to the total amount of the S+ samples, should be prepared.
- (2) Prepare S+ samples: it is suggested that the H be cut 50 percent and 75 percent with each of the diluents. That is, mix 50 percent H with 50 percent each of the diluents.

The dog's task will be to positively respond to the H and the diluent mixtures and ignore the diluents in pure form. The following is a step by step progression of how each of these diluents should be introduced to the dog:

- (1) Trials 1-10—S+ H in plastic bag in pasteboard box  
S- empty plastic bag in pasteboard box
- (2) Trial 11—S+: 50 percent mixture of H and mannitol in plastic bag in pasteboard box  
S-: Pure mannitol in plastic bag in pasteboard box

If the dog responds positively to the H and mannitol mixture and does not respond to the mannitol in pure form, continue to run the dog on these samples until Trial 25.

- (3) Trial 25—Introduce new H and mannitol and pure mannitol samples. If the dog does not make errors on these new samples, you may assume the dog has learned to discriminate H mixed 50 percent with mannitol.

The same discrimination procedure should be used with each of the diluents. The percentage should be reduced to 25 percent H mixed with 75 percent of each of the diluents. If at any time the dog's behavior becomes disrupted or the dog begins to make frequent errors, return to a simpler task until the dog is again working well.

### C. Advanced Room Search

Advanced room search is the last and most lengthy phase of the training program. It differs from basic room search only in the degree of difficulty of the task for the dog. As advanced room search progresses, the dog is given practice in searching for S+ samples that are under greater and greater degrees of concealment and increasingly diverse situations, hiding places, masking odors, packaging, etc. By the end of this phase, the dog should have been trained to find the narcotic samples under conditions approximating almost any it is likely to encounter in actual narcotic detection.

Advanced room search is not a discrete phase of training, but rather a gradual development from basic room search. Once the dog is able to find "easy" samples of a particular S+ in "easy" locations, the samples are gradually made more difficult to find in a variety of ways. The following are some of the factors to be considered in advanced room search:

- (1) The quantity of S+ material may be reduced; the more odorous materials, such as marijuana, hashish, and opium, may eventually be reduced to a few hundredths of an ounce.
- (2) The heroin and cocaine samples may be diluted with larger and larger quantities of the various diluent materials. S- samples containing the same diluents and prepared by the same individuals as the S+ samples must also be used.
- (3) The S+ packets, instead of being housed in glass jars, may be wrapped in paper or plastic, may be boxed in pasteboard boxes, or both. The wrapper or box may then be sealed to various degrees with plastic tape.

Similar packages, containing packets of various S- materials, should be used along with the S+ packages. The same individual(s) who make up the S+ packets should also make the S- packages; the S- ones should always be made first in order to avoid contaminating them with S+ odors. The number of different individuals who prepare the S+ and S- packages, and also the number of different kinds of packaging and sealing materials, should be as large as practical.

- (4) The time the odor sample has been in place before the room is searched can be lengthened and also made more variable. Times up to 24 hr should be included. As with the other changes mentioned, this change should be introduced gradually. The sharp odor gradient which has characterized the recently planted samples may dissipate over time, making it difficult for the dog to localize the source of an odor. In addition, when working with the less volatile odors of heroin and cocaine, a longer period of time will be required before there is an odor present.
- (5) Rooms containing gradually stronger and more varied masking odors should be included. The odors of paint, petroleum products, clothing, people, food, animals, chemicals, and vegetation are all good masking odors. Where possible, emphasis should be placed on those masking odors that the dog is most likely to encounter in actual searches.
- (6) Rooms of increasing size and complexity of shape should be included. The quantity and diversity of the contents should also be increased. These changes should be made very gradually, since their effect is to increase greatly the amount of searching required per detection.
- (7) The samples can be hidden in progressively more difficult locations, especially at increasing elevation above the floor. When this is done, an occasional sample should be hidden in a location of the sort used previously, so that the dog will not stop searching the easy areas.
- (8) If the dog will need to search drafty areas, drafts should be introduced gradually into advanced room search. The handler should be aware that the draft sometimes causes the dog to sit at considerable distances from the S+ sample.
- (9) If the dog will need to search for narcotics in areas containing people, noisy or moving equipment, or other distractions, a variety of similar distractions should be included in room search. How gradually this must be done varies with the temperament of the dog. It is well to begin including small distractions early in room search training, especially if the dog appears to be at all distractable or "skittish."

Training in advanced room search can begin before the transfer to all narcotics has been carried out. If convenient, it can start as soon as basic room-search training with Hex and the first narcotic is finished. If this is done, the dog may receive advanced room search training with strong odors in some sessions, while receiving basic room search training with the next strongest odor in other sessions, six-choice discrimination with the third strongest odor in still other sessions, etc.

#### IV. USE OF TRAINED DOG IN NARCOTIC SEARCH

The specific way in which contraband search is conducted will influence the exact manner in which the detector dog will be used, since the detector dog team must fit into the overall search plan. Hence, while the following procedures should work well under most circumstances, they may have to be modified somewhat to meet particular user requirements.

There are three types of training sessions which will be used in maintaining the detector dog. The procedures for all three types are very similar and are as follows:

- (1) **Operational Session.** This session is under conditions of actual contraband search. During the operational session the team will keep records of the dog's performance and of any special problems which may arise.
- (2) **Maintenance Session.** This is a training and evaluation session. Any special problems in the dog's detection performance can be systematically evaluated during these sessions, and any corrective procedures or remedial exercises which seem needed can be carried out.
- (3) **Evaluation Session.** This is as similar as possible to the operational session except that contraband is actually hidden. The purpose of this session is to test the dog under simulated operational conditions. The contraband should be planted by a person who is not directly associated with the detector team itself.

##### A. Programming S+ Samples

The number of S+ samples planted in the area to be searched in a session constitutes the "program". If the dog is scheduled to search 10 rooms, then the number of S+ samples placed in these 10 rooms would be the "program" for that session. This could range from one or more S+ samples in each room to one S+ sample in only one of the 10 rooms.

The programming of the S+ odor is perhaps the most difficult task the detector team will face. The question is, how many S+ samples do you place during any particular session? Unfortunately, no very precise guidance can be given, and the decision will have to be made largely on the basis of guesswork by the programmer. The number and type of S+ odors to be planted will necessarily depend on many different conditions and the best program will not be the same for all dogs. The environment in which the dog is working will require different schedules of S+ programming. The day-to-day changes in performance of the dog will also affect subsequent programming.

The basic rule for determining the number of S+ samples is: plant the number of S+ samples estimated to be required to keep the dog actively searching, plus a few additional plants "for good measure". If the program is too lean (too few S+ samples) the dog will not maintain good search behavior. On the other hand, if the program is too rich (too many S+ samples), a great deal of time will be taken rewarding the dog for detections and the dog's hunger will quickly become too low for effective search. The reason for the few extra plants is that too rich a schedule can do less harm than too lean a schedule. The decision on how to program a particular area will be the responsibility of the programmer, and how effectively he performs this duty will be crucial to keeping the dog working efficiently. If there is any doubt about the program, or if the dog's detection rate is decreasing or poor search behavior is shown, enrich the program (plant more S+ samples) and then gradually make the program leaner.

S+ samples should be planted in all types of sessions, including operational sessions. The major purpose of planting S+ samples is to keep the dog working at maximum efficiency. The reason it keeps working is that it is very rewarding to the dog each time it detects the S+ odor. If there were no S+ stimuli to detect, the system of rewards under which the dog was trained would no longer be in effect, and the searching behavior would gradually deteriorate. If the S+ samples were planted on all types of sessions except operational sessions, the dog would eventually learn to remain efficient in all types of sessions—except operational sessions!

A second purpose is to evaluate the dog's efficiency on a given session. This is especially important for those operational sessions in which no contraband is found. The detection of plants during these actual searches for contraband indicates that the failure to detect contraband was probably due to the absence of the material, rather than to any lack of efficiency of the dog.

##### B. Operational Session

Although one person can conduct an operational search, the detector team should consist of two or, if possible, three persons. This allows one person to survey and program the area to be searched and one person to work the dog.

The initial duty of the programmer is to quickly ascertain the size of the area to be searched and to determine the length of time which can be allotted to the dog and handler in the area. It is his duty to determine which areas are considered high priority areas to be searched. These are areas or objects where contraband would most likely be hidden, typical areas where contraband has been found previously. Other areas which a dog could quickly search but would be time consuming for a human

to search would also be an area designated for the dog to search. Places such as libraries, lockers, and areas with a great many objects, especially if they are concealed or locked, are examples which fall into this category.

The programmer must decide how to search the area most efficiently on the basis of the size and the complexity of the area and the time which is available. He also searches areas which would be difficult or impossible for a dog to search.

It is during this initial investigation that the placement of the S+ samples is carried out. The immediate area in which the S+ sample is hidden is thoroughly searched by the programmer prior to the S+ placement. This is done to insure that there is no actual contraband where the S+ is placed; otherwise, the dog's response to hidden contraband might be confused with the response to the S+.

C. Maintenance Session

Maintenance sessions are somewhat like a continuation of advanced room search. A handler and a programmer are required to conduct these sessions. The maintenance session not only serves to keep up the efficiency level of the dog, but also to give the dog additional training. Any or all of the narcotics to which the dog is trained can be tested in these sessions.

Any problems which may have been encountered during operational or evaluation sessions can be systematically dealt with during maintenance sessions.

The amount of time and effort which will be required to maintain the dog on the various drug odors will not be the same for each of the odors. For example, a dog trained to detect all five of the narcotics specified in this manual *should receive more training with heroin and cocaine than with marijuana, opium, or hashish*. The following is a breakdown of various combinations of detector dog capabilities and the percentage of time which should be devoted to each drug during training sessions. Naturally, if the dog is trained to detect one drug 100 percent of the training time will be spent with that drug. This is shown in the extreme left hand column. The extreme right hand column shows the percentage of training time which should be directed to each drug if the dog has been trained to all five odors.

No. of Odors	Percentage of Time				
	1	2	3	4	5
Heroin	100	50			40
Cocaine	100	50			40
Marijuana	100		50	30	5
Hashish	100		50	30	5
Opium	100			40	10

These percentages represent the relative amount of exposure the dog should receive during room search exercises. For example, if a dog has been trained to detect all five odors, 40 percent of the training time should be spent with heroin, 40 percent with cocaine, 5 percent with marijuana, 5 percent with hashish, and 10 percent with opium.

D. Evaluation Session

The purpose of the evaluation session is to ascertain the dog's effectiveness under conditions which as nearly as possible represent what would be expected in an actual field search. If possible, contraband which has been confiscated by means other than by the dog should be used in this exercise. The services of a person associated with the narcotic squad who is not a member of the detector dog team is recommended. This person will set up a problem which as nearly as possible resembles what would be expected under actual working conditions. The detector team is given the problem and their task is to locate the hidden contraband. The individual who hid the contraband should have no contact with the programmer or handler until after the problem is terminated. This is *NOT* a test to prove that the dog has the capability of detecting contraband, but rather to evaluate the dog's efficiency on a particular problem which might be encountered in the field.

After the problem has been run, all aspects of the session should be discussed by the detector team and the persons who set up the problem. This discussion should be very helpful in improving the capabilities of the detector team.

This session should be conducted by the detector team in exactly the same manner as an actual operational session would be conducted. It is very important to carefully analyze the data from these sessions. If the detector team locates the planted contraband, ascertain the search procedures which led to the detection. On the other hand it can be even more beneficial if the team fails to locate the plant. For in this case, a careful analysis of the session will most likely lead to some notions as to the reasons why the team failed to locate the contraband. Once these reasons are determined, the appropriate measures can be taken to improve the team's capabilities. In this way, the detector team can be continually improved.

E. Practical Applications

It has been emphasized that there is much less odor emitted by heroin and cocaine than is emitted by marijuana, opium, or hashish. Although the basic training principles and maintenance procedures presented in this manual apply to both groups of drugs, there are some fundamental differences in the practical application of these principles. The following comparisons of what is expected of the trainer and of the dog in regard to working with these two drug groups should illustrate these differences. Keep in mind these are not differences in principles—but differences in degree:

- (1) The special care which must be taken when working with training samples of heroin and cocaine has already been described. Such extreme care is not necessary when dealing with training samples of the more odorous drug group. On the other hand, more care must be taken in controlling for contamination and residual odors with the more odorous drugs.
- (2) Naturally the dog must work more thoroughly in order to detect heroin and cocaine. The time required to detect a sample of heroin as opposed to a comparable sample of marijuana may be tenfold. The handler must direct a dog more if the dog is searching for H/C than if it is searching for MJ/Hash.
- (3) The amount of time and effort which will be required to maintain a narcotic detector dog will depend upon which of the drugs or combination of drugs the dog has been trained to detect. The following is a general description of the relative ease of training and maintaining the multi-narcotic detector dogs.
  - *Heroin is the most difficult drug to train a dog to detect.* A great deal of effort will be required to train the dog to detect this drug. If a dog is to be trained to detect heroin, relatively little extra effort is required to train and maintain this dog on all four of the additional drugs.
  - Training and maintaining a dog on cocaine detection requires about the same amount of time and effort as it takes to train a heroin dog. However, much less effort is required in preparing cocaine training samples as compared to the effort required with heroin samples. If a dog is trained to detect cocaine, very little extra effort is required to add detection of marijuana, opium, and hashish capabilities.
  - It would require about the same effort to train a dog to detect either marijuana, opium, or hashish as it would to train the dog to detect all three.

## V. POOR PERFORMANCE—CAUSES AND REMEDIES

There are three main classes of problems that can be experienced in training detector dogs. They are:

- (1) Missed targets—Failure to detect one or more of the S+ odors.
- (2) False responses—The dog sits when there is no S+ odor in the area.
- (3) Poor search behavior—
  - Locomotor—Dog does not move around the area to be searched.
  - Sniffing—Dog moves around the areas to be searched, but does not sniff at objects with which he comes in contact.

There are a variety of reasons that may account for one or the other of these problems. The following is a list of some of the more likely causes associated with these problems, and a brief discussion of each problem as well as some clues as to how to deal with them when they arise.

Perhaps the most basic rule to follow if the dog begins to perform poorly is to revert to a simpler task, and, once the dog is performing well, gradually make the task more difficult. If the dog begins to make errors and is allowed to continue in the same task, its performance will probably continue to deteriorate and a great deal of remedial work may then be required to recapture the dog's previous level of performance.

### A. Missed Targets

If the dog fails to sit when the S+ odor is in the vicinity, the most likely reason for the failure to sit is that the odor has not been detected. No dog will always detect all S+ stimuli which have been planted; however, a well-trained and well-maintained dog should detect a high percentage of the S+ stimuli which have been planted.

Extended periods of searching with no detections may result in poor performance. Therefore, a certain number of correct detections and rewards must be programmed into the dog's daily working sessions. There are two ways to insure that extended periods of searching will not go unrewarded: (1) make the item to be detected very easy to find, and (2) make the plants more difficult to find, but place several of them in the area to be searched. If it is possible, placing several difficult S+ plants in the area is the preferred practice. The reason is that detecting difficult plants requires good search behavior and thus the dog is more likely to be rewarded for good search behavior when the S+ stimuli are relatively difficult.

Missed targets can also result if the dog learns to rely on cues other than those of the narcotic material itself; when these false cues are not available, the dog fails to respond to the odor.

### B. Marking

There is always the possibility that the dog will "mark" the S+ stimuli. That is, when the same S+ stimuli are reused, the dog may leave a sign by licking or salivating on the material which it can detect on subsequent trials, so that it may be responding to something other than the S+ odor itself. This will result in missed targets when new stimulus materials, to which the dog has not been exposed, are used. If the detection rate is approximately the same for both the old and the new S+ stimuli, it can be assumed that the dog is responding to the S+ odor. It is essential to replace the old S+ materials with new samples frequently. This will assure that the dog is responding to the S+ odor and not on the basis of a sample which has been marked.

### C. Following

When several dogs are trained to search for the same set of samples, some dogs may learn to follow others. When an area is programmed for the dog to search, it is most convenient to test several dogs on the same program, but this entails the risk of having one dog learn to follow another and, therefore, find targets that have been previously detected by another dog. Also, there is always the chance that the odor of food is also present in the vicinity of the hidden S+ after one dog has been rewarded there. Even if the dog is not depending entirely on either of these two extraneous cues, it may use either or both to orient to the general vicinity of where the S+ is hidden. If it is necessary to run more than one dog on the same program, alternate the order in which the dogs are run. If a particular dog is run first on one session, it should be run last the next session. The S+ stimuli can be moved if the programmer is certain there will be no residual odor. For example, if the S+ is hidden in a box, the box could be moved to another location in the room. If a particular dog does well when it follows another dog and does poorly when run first or when the position of the S+ is changed, there is a strong possibility that this dog is following another dog. In this case, steps should be taken to eliminate the opportunity to follow.

#### D. Human Odors

The sensitivity of the dog to most odors makes it possible to train it to detect almost any type of odor. Dogs are especially sensitive to the odor of humans. It is well known that dogs can be trained to detect human odors several hours old. Training problems can arise because of this keen sensitivity.

There is always the possibility that the dog is detecting the odor of the person who prepared or planted the S+ instead of the actual S+ odor. This is especially troublesome if the S+ odor is weak. There is no great cause for concern if it is the S+ odor plus any human odor that the dog responds to, as this will be the case in the dog's detection of contraband. The real problem arises if the dog is responding to a particular human odor which is consistently associated with the S+ odor, that is, if the dog is not responding to the narcotic odor, but to a specific human odor which is consistently associated with it. It is easy to check to see if the dog is responding to the narcotic odor rather than to the human odor by simply having a different individual prepare and hide the S+ and S- stimulus packets.

#### E. Other Contaminating Odors

The S+ samples may absorb odors of materials with which they came into contact. The contaminating odors are often far more potent than the actual S+ odor, so the dog learns to respond to the contaminants and to ignore the S+ odor component. This shows up when the old S+ samples are replaced with new ones. Frequent replacement of old S+ samples will greatly reduce the opportunity for the dog to learn to respond to contaminating odors, and will reflect any such learning before it can become firmly established.

#### F. Handler Cues

Any behavior on the part of the handler, whether intentional or not, may affect the dog's behavior. Handler cues may well become a problem if the handler knows where the S+ is hidden in the area being searched. In other words, if the handler knows the conditions under which the dog is working, he may unintentionally cue him. Generally, it can be assumed that if the handler does not know anything about the placement of the S+ and S- stimuli, he will not cue the dog, and the dog will not learn to watch the handler for cues.

It is very important that while the dog is in training it only be given food under conditions specified in this manual. Giving food to the dog on other occasions will only tend to interfere with its search and detection behavior. If it receives food indiscriminately, it will become "food bag" oriented. This tendency to orient toward the handler and bag for food is very undesirable. Therefore, the dog should only receive its reward following conditions outlined in this manual; namely, reward only for a correct response to the S+ odor.

#### G. False Sits

This is a somewhat more complicated problem as there are a variety of conditions which may result in the dog sitting in the absence of an S+. When a false sit occurs, do not praise or give food to the dog. At the time, investigate the reason for its false sitting, so that the necessary precautions can be taken to see that the same problem will not recur.

There are several factors which may cause false sits and there are also factors which may precipitate what appears to be a false sit but which is actually a correct response. The following discussion gives some of the most common factors associated with false sits.

It is possible that the handler may do something to cause the dog to false sit. In this case, do not reward, but repeat the command SEARCH. In most instances, the dog will again begin to search the area until a detection is made.

If it is clear that the handler did not prompt a false sit and the possibility of contamination or residual odor have been eliminated, punishment by NO or TIME OUT should be given. The removal of the dog from a setting which affords social contact with the handler and eliminates the opportunity for the dog to earn food is punishing the dog. This TIME OUT period should always be preceded by the verbal NO. The use of a TIME OUT period has much the same effect as physical punishment in eliminating unwanted behaviors, but it has none of the more harmful effects associated with physical punishment. Therefore, if the dog makes a false sit that was not prompted by the handler or other extraneous factors, say NO and immediately take the dog out of the search situation. This procedure has been found to work especially well in eliminating false sits.

##### 1. Odor Contamination

Whenever an S+ packet is handled, some of its odor may adhere to the hands and may subsequently be transferred to other objects that are handled. Such objects are said to be contaminated with the S+ odor and may be responded to by the dog, especially if the S+ has a strong odor or the dog has become highly sensitive to that S+. Since the handler ordinarily has no way of telling that the object is contaminated with the S+ odor, he runs a risk if he rewards the dog for sitting to it. Hence, every time the dog sits to a contaminated object and is not rewarded, it is actually being trained to

ignore a very weak S+ odor, which is just the opposite of what the handler desires. On the other hand, if the handler goes ahead and rewards the dog because he suspects contamination and there is no S+ odor present, the tendency for the dog to false sit will be greatly increased. For this reason, every effort should be made to avoid unnecessary handling of either the S+ or objects in the area to be searched.

##### 2. Residual Odors

After a particular odor has been placed in a certain place and then removed, it should be assumed that the odor might well remain in the area for some time. This is referred to as residual odor. After an S+ packet has been placed in a closed place and removed, the odor that remains in the closed place may last for days. Certain materials such as paper or other porous materials may retain this residual odor for an extended period. Be sure to air out completely any place where an S+ has previously been placed, but do not assume that residual odors are thereby necessarily eliminated.

Residual odors can become troublesome if it is necessary to run repeated sessions in the same area. Remember, if a dog responds to a residual odor, this is a correct response and should be reinforced just as if an S+ had been placed in that spot. The main problem here is that there is no way of knowing whether there is actually the S+ odor present or not, since the dog might have remembered the place from a previous run. The only good solution to this problem is to avoid running a dog where a residual odor may be present.

##### 3. Odors Similar to the S+ Odor

For any given substance that the dog has been trained to detect, there probably will be several other substances that— to the dog—smell much like the S+. The dog has not been specifically trained to ignore all such odors and is, therefore, likely to react to them as S+ odors. Hence, if the dog were punished for what the handler regards as a false sit, to the dog it would be punishment for a correct response. This may greatly weaken the dog's future tendency to sit to "real" S+ odors, impairing its usefulness in detecting the S+ substance. On the other hand, rewarding the dog for responding to such odors will increase the range of false odors to which it will respond.

The problem is similar to that of residual odors, but is more vexing since there is no way of insuring that the "false" odors will not be present.

A sit to a suspected false odor should be treated like a sit that was accidentally evoked by the handler, i.e., neither reward nor punish the dog, but instead repeat the SEARCH command. If the dog repeats the sit response, remove the object from the area, or, if this is not possible, remove the dog from the situation. A description of the object should be recorded and, if possible, the object should be tested with other dogs. If a particular substance becomes problematic, the dog should be returned to the laboratory setting and taught to respond to the S+ and to ignore the odor of the similar substance. This should be conducted just as initial discrimination training with the substance in question being an S-.

#### H. Poor Search Behavior

If the dog is not searching properly, this will ordinarily be detected by observing him. Slow or ill-directed locomotor behavior is one type of poor search behavior and failure to sniff the area is another type. Both of these components may occur together; however, there are times when one will appear by itself. Good locomotor behavior is more often found with poor sniffing behavior than poor locomotor behavior with good sniffing behavior.

Another way to tell if the dog is searching properly is to evaluate the percentage of S+ detections he makes. Although there are reasons other than poor search behavior which may account for a poor S+ detection rate, the most likely explanation is that the dog is not searching properly.

Whenever the dog is not searching properly or is not making a reasonable number of detections, it should be removed from the working situation. Do not continue to try to keep a dog working if it is apparent that it is doing poorly. After removing the dog from the work situation, attempt to determine the possible cause of its poor search behavior and take steps to eliminate the problem before taking it back into the working situation. The following are the most frequent causes of poor searching:

- (1) *Illness.* If the dog appears to be sick, it should not be worked. However, at times the dog may be sick and yet not display any observable signs. Poor search behavior may indicate that the dog is sick and, if it is, the proper medical steps should be taken immediately.
- (2) *Fright.* If the dog becomes frightened or distracted, its search behavior will be interrupted. If it becomes frightened, attempt to reassure it by talking to it. If the handler becomes aggressive or attempts to force the dog to continue to search, the situation becomes worse. Fear is originally established through punishment. Anything originally associated with punishment, for example, sharp verbal commands or jerks on the dog's leash, will increase its fear and make its search behavior even worse.

If the dog becomes fearful of something in particular, the following method is suggested to reduce the fear. For example, suppose that the dog is afraid of loud noises. Bring the dog very slowly to a noise source, while petting it and talking gently to it. As the dog is brought close to the noise, give it food. Do this very gradually and do not ever force the dog to move toward the noise source.

- (3) *Fatigue.* There will be times when the dog will become fatigued during the training session. It may generally continue to search but its efficiency will be impaired. This will most likely result in the dog's walking around the room but failing to sniff and failing to bring its nose close to objects. If signs of fatigue are noted, give the dog a short rest and then resume the training session. For extended search periods, have water available for the dog. A single search session should not exceed 1 hr, and should not be continued this long if the dog shows signs of fatigue.

The best procedure of all is to avoid leaving the dog in the working situation long enough for its behavior to be adversely affected. For extended search periods, this means allowing the dog short rest periods and access to water periodically before any signs of fatigue, thirst, or poor searching are shown.

## APPENDIX A SAMPLE DATA SHEETS

DATA SHEETS - INITIAL OLFACTORY TRAINING

Experiment: \_\_\_\_\_ SCHEDULE: ASSOCIATION OF S+ WITH REWARD

Trainer(s): \_\_\_\_\_

Date(s): \_\_\_\_\_ Dog: \_\_\_\_\_

Notes:

Ratio S+ S-												
2 - 1	+	+	-	+	-	+	-	+	+	-	+	+
1 - 1	+	-	+	-	-	+	-	+	-	+		
1 - 2	-	+	-	+	-	-	-	+	-	+	-	-
1 - 3	-	+	-	-	+	-	-	-	-	-	+	
	-	-	-	+								
1 - 4	-	-	+	-	-	+	-	-	-	-		
	-	+	-	-	-	-	-	-	+	-		
1 - 5	+	-	-	-	-	-	-	-	+	-	-	-
	-	-	-	-	+	-	-	+	-	-	-	-
1 - 6	-	-	+	-	-	-	-	-	+	-	-	-

Data Sheet No. 1

Notes:

Time(s): \_\_\_\_\_

[illegible]**Data Sheet No. 2**

**DATA SHEET--SIX-CHOICE DISCRIMINATION TRAINING**

Six-choice Discrimination Training: Hex: 1/16" hole

Dog:

— Handler: —

— Programmer: —

Date: \_\_\_\_\_

[illegible]

**NOTES:**

Data Sheet No. 1

ROOM-SEARCH \_\_\_\_\_ PLACE: \_\_\_\_\_

Date: \_\_\_\_\_ Time(s): \_\_\_\_\_

[illegible]

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## APPENDIX B. MAINTENANCE OF HEROIN AND COCAINE

Both heroin and cocaine are extremely sensitive to moisture and, when exposed to the atmosphere for only a short period of time, will very quickly absorb ambient moisture. This process of hydrolysis causes a definite and discernible change in the odor profiles of both these narcotics. Inasmuch as both of these drugs deteriorate through hydrolysis, it is assumed that persons dealing in these agents would take measures to insure that they would not be exposed to moisture. In order to train dogs to respond to heroin and not to chemical radicals produced when moisture decomposes heroin, the training aids must be moisture proofed. These controls apply to both the stock sample and to the training aids.

The following is a step by step procedure which can be used to insure proper control of the odor profiles of heroin and cocaine. The materials needed are listed below:

Material	Source	Price
1. Desiccator, Sleeve Top, Pyrex brand glass, #076-653 160 IDmm	Curtin Scientific 357 Hamburg Turnpike Wayne, N.J. 07470 Phone 201/278-3300	\$27.27 ea.
2. Desiccator Plates, Porcelain Coors Serial 600 without feet Size 3 to fit 160 IDmm Desiccator	Curtin	5.21 ea.
3. Gas washing bottle, with fritted cylinder, pyrex brand glass Serial 31770 Series 124-073 Cat. #124-115, 500 ml	Curtin	21.57 ea.
4. Stopcock grease, Lubriseal #218-651 (tube) Items 1-4 Curtin Scientific Item 11	Curtin	.75
5. Teflon tubing 1/32 Flexible Penntube	Penntube Plastics Co. Clifton Heights, Pa.	
6. Rubber stoppers 62-0409	Supelco Inc. Bellefonte, Pa.	
7. Heat seal plastic bags (freezer type) 4 x 2 x 8 in.		
8. Nitrogen cyl. (Nitrogen gas medical grade-dry)		
9. Nitrogen regulator 2-stage		
10. Sliding powder boxes HL372800	Lone Star Vet Supply 2909 Shamrock P.O. Box 9646 Fort Worth, Texas	6.00 carton
11. Drierite, Indicating 8 mesh (blue)	SWIC Scientific Labware Inc. 1071 Fratt Rd. San Antonio, Texas	

All narcotics must be kept in a safe place and the laws are very strict in their control even for experimental and other useful purposes. The legal aspects of obtaining and keeping narcotics for the purpose of training dogs will not be covered in this manual.

The following is the procedure to be used in cleaning bulk heroin or cocaine of extraneous odors, moisture, or other contaminants not consistently associated with these narcotic agents. Failure to take these or similar precautions may well

result in a dog trained to detect some extraneous odor component other than that of the narcotic. These rather involved precautions are applicable to H and C but are not necessary when working with MJ, Hash, or O.

Any quantity of H which will be designated for use in training the dog will necessarily have some odor configurations peculiar for that particular sample. It should be reiterated that the dog will learn to respond to whichever odor(s) that are strongest in the sample with which it comes into contact. Therefore, if a particular batch of H has some unknown odor component which is as strong or stronger than H associated with it, the dog will actually learn to respond to the extraneous odor and may very likely fail to respond to a quantity of H if this extraneous odor is absent. It should be noted here again that heroin in its pure form has very little odor and most other substances will have a stronger odor.

The second factor which makes it necessary to clean up the H is that there will most likely have been some deterioration of the H which will be used in training. H will deteriorate a certain amount even if it is fairly well sealed. The amount of decomposition is a function of age and how well it is sealed. The sample you are likely to have may be quite old and therefore have a high quantity of acetic odor associated with it. Acetic odors even in very minute concentrations are more odorous than pure H. For these two reasons, it is necessary to "clean up" the H which is intended to be used in training. This can be done quite quickly and efficiently with the equipment described earlier. The following is a step by step method for achieving this goal:

- (1) Remove the H from its original container and place the contents into the gas washing bottle.
- (2) Attach rubber bands to the "ears" on both sides of the wash bottle. This assures that the top portion fits snugly to the bottle portion.
- (3) Attach one end of the teflon tubing to the wash bottle by means of the tubular glass extension which is in the center and connects directly to the stone at the end of the glass tube located inside and toward the base of the bottle. Attach the other end of the teflon tubing to the nitrogen cylinder (this should be medical grade dry nitrogen gas) by way of the flow regulator valve.
- (4) Once this hook-up has been made and all connections fit firmly, open the flow regulator valve to a flow rate of 10cc/min. This will allow dry nitrogen gas to pass from the nitrogen cylinder into the wash bottle by way of the stone. This action will purge and remove any moisture or extraneous odors from the H.
- (5) The amount of time required to thoroughly purge the H will depend upon several factors such as the quantity of H in the bottle, the amount of acetic odor present which must be removed, and the nitrogen flow rate. You may use this rule of thumb in determining when to consider the stock sample adequately cleaned.

Initially, as the nitrogen is passed through the bottle you will most likely be able to detect an acetic odor at the exhaust stem. Continue to check until there is no longer a discernible odor; then allow the nitrogen flow to continue for about 1 hr before packaging the training samples.

## APPENDIX C

### PREPARING AND MAINTAINING SAMPLES

#### APPENDIX C. PREPARING AND MAINTAINING SAMPLES

Once the stock quantity of H has been cleaned, individual samples which will be used to train the dogs should be prepared. The materials which will be needed are:

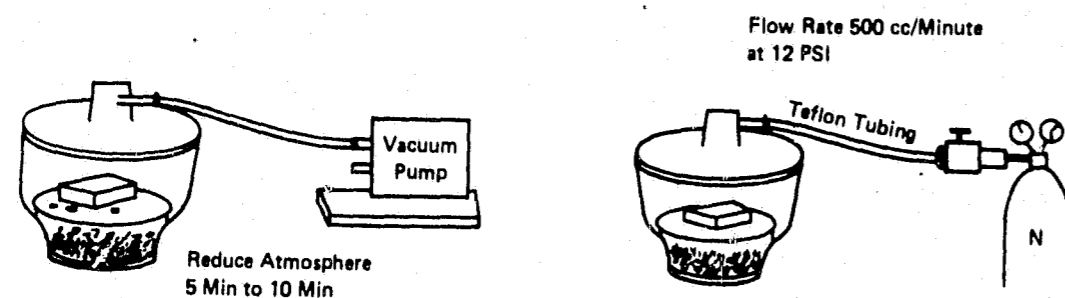
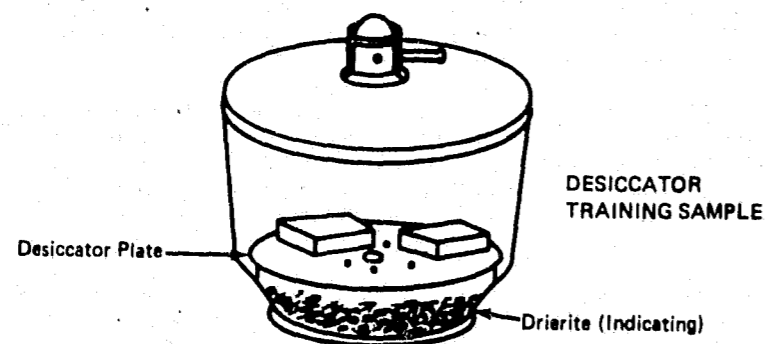
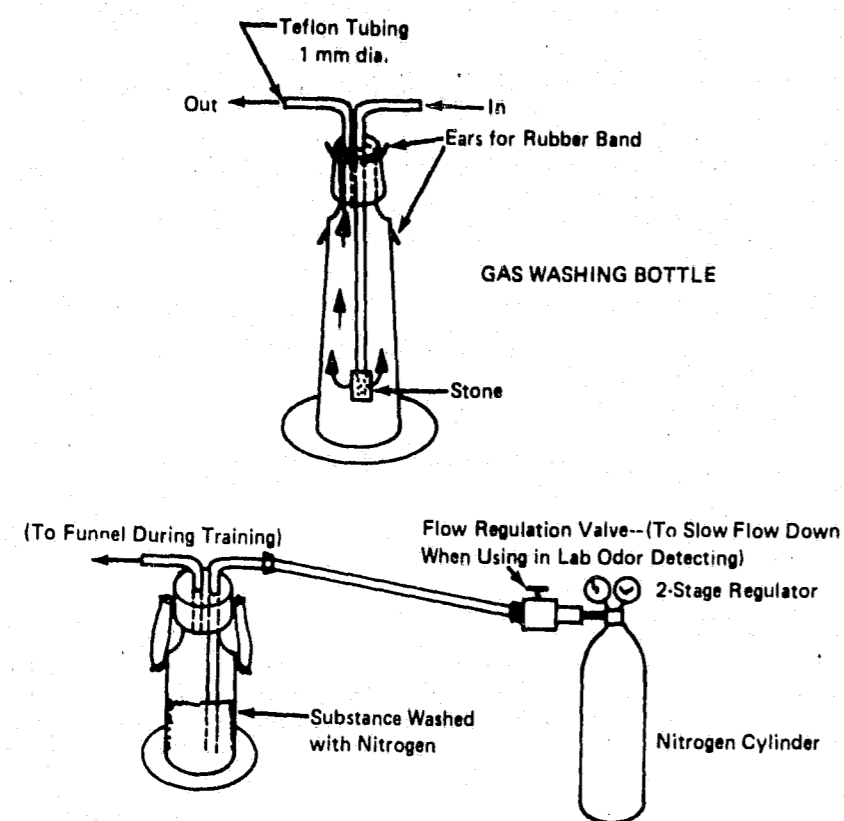
- (1) A quantity of plastic bags (freezer type). The larger the variety of these bags the better.
- (2) A device used to heat seal plastic bags. This item can be purchased at any large department store at a nominal cost.
- (3) A sterile stainless steel spatula which will be used to measure out the H samples.
- (4) Several small pasteboard boxes suitable for storing the samples.
- (5) Desiccator, sleeve top, pyrex brand glass.
- (6) Desiccator plate, porcelain without feet, to fit the desiccator.
- (7) Drierite.
- (8) Glassine paper.
- (9) Small vacuum pump.

Prior to making the S+ samples identical S- samples should be made. These samples should be identical to the S+ samples except for the absence of the drug. The S- samples should be made up prior to making the S+ samples. They should be of the same material, made by the same person, and made in an area other than where the S+ materials are stored or otherwise worked with. These precautions eliminate the possibility of unwanted contamination of the control samples.

In preparing the S+ samples, the first step is to determine the number of samples which are needed and the quantity of drug in each sample. Glassine paper is placed on a scale and the desired quantity is removed from the stock bottle with the sterile spatula and put into the plastic freezer bags. The plastic bag is then heat sealed to insure that a minimum of humidity and other contaminants will become associated with the heroin. These S+ samples should be placed in appropriately sized pasteboard boxes for storage and transfer.

The following is a description of how the S+ samples should be stored when not in use: S+ samples will be stored in a large desiccator. A generous quantity of drierite should be placed in the bottom of the desiccator jar and the porcelain plate placed in position. Drierite changes color after it absorbs moisture and therefore should be replaced when this occurs. The samples can be stored inside the pasteboard boxes or removed from the boxes and stored in the plastic bags. The desiccator in which the samples are stored should be vacuumed off and then purged with dry nitrogen after the samples have been placed inside.

A tube leading from the vacuum pump should be connected to the intake sleeve. The desiccator should be vacuumed and the sleeve rotated to maintain the vacuum. The tube from the nitrogen cylinder should then be connected to the sleeve arm, the sleeve arm is then rotated back to the position which allows gas flow back into the dessicator. Nitrogen gas flow should be continued until the desiccator has reached equilibrium. The sleeve should again be rotated so as to exclude outside air from entering the desiccator.



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DOCUMENT CONTROL DATA - R & D		
<small>(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)</small>		
1. ORIGINATING ACTIVITY (Corporate author) Southwest Research Institute 8500 Culebra Road San Antonio, Texas 78284		2a. REPORT SECURITY CLASSIFICATION Unclassified
3. REPORT TITLE Final Report: Training Dogs for Narcotic Detection		2b. GROUP
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Final Report covering Contract No. DAADO5-71-C-0285, Amendment I		
5. AUTHOR(S) (First name, middle initial, last name) Dr. Edward E. Dean		
6. REPORT DATE July 1972	7a. TOTAL NO. OF PAGES 44	7b. NO. OF REFS
8a. CONTRACT OR GRANT NO. DAADO5-71-C-0285	8a. ORIGINATOR'S REPORT NUMBER(S) SWRI Project No. 13-3095, Amend I	
b. PROJECT NO.	8b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
c.		
d.		
10. DISTRIBUTION STATEMENT Approved for public release; distribution unlimited.		
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY
13. ABSTRACT <p>The abuse of hard narcotics (heroin and cocaine) has risen sharply in recent years, and coping with this problem has become an important responsibility of law enforcement agencies. In order to assist these agencies in adequately carrying out this increasingly important responsibility, methods have been developed for the training and use of narcotic detector dogs.</p> <p>Considering these advantages it is obvious that a good detector dog and a well trained handler can search for narcotics rapidly and efficiently. A detector dog can be a valuable asset in narcotic detector work and this manual is designed to describe, in a step by step fashion, how to train dogs to effectively search out and respond to hard narcotics.</p>		

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