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BODY RECOVERY DOG

Woodrow L. Quinn, Jr., et al

Army Land Warfare Laboratory
Aberdeen Proving Ground, Maryland

May 1973

TECHNICAL REPORT NO. LWL-03B73

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Final Report

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13. ABSTRACT

A four-month study that demonstrated the feasibility of training dogs to search for and locate human casualties under conditions that might exist in the aftermath of man-made or natural disasters was conducted as a joint project by the U. S. Army Land Warfare Laboratory and the U. S. Army Infantry School. Four body recovery teams, each consisting of a dog and its handler, were trained to search in mud, water, rubble of demolished buildings, wrecked vehicles, and in sanitary fills and dumps for simulated human casualties. A training odor source, consisting of a mixture of macerated sub-human primate tissues, was used to mark the simulated human casualties. Training procedures utilized food as the primary reinforcer. At the conclusion of the study the four body recovery teams were placed in a stand-by status at Fort Benning on a maintenance training schedule. The teams are available for employment by civilian as well as by military authorities in the event of a disaster.

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A four-month study that demonstrated the feasibility of training dogs to search for and locate human casualties under conditions that might exist in the aftermath of man-made or natural disasters was conducted as a joint project by the U. S. Army Land Warfare Laboratory and the U. S. Army Infantry School. Four body recovery teams, each consisting of a dog and its handler, were trained to search in mud, water, rubble of demolished buildings, wrecked vehicles, and in sanitary fills and dumps for simulated human casualties. A training odor source, consisting of a mixture of macerated sub-human primate tissues, was used to mark the simulated human casualties. Training procedures utilized food as the primary reinforcer. At the conclusion of the study the four body recovery teams were placed in a stand-by status at Fort Benning on a maintenance training schedule. The teams are available for employment by civilian as well as by military authorities in the event of a disaster.

FOREWORD

The joint USALWL-USAIS study described in this report was conducted under LWL Task 03-B-73, Body Recovery Dog. The LWL Task Officer and junior author of this report, Mr. Nick Montanarelli, provided overall coordination of the project and technical assistance to the USAIS Military Dog Detachment. The senior author, CPT Woodrow L. Quinn, Jr., of the Military Dog Detachment, supervised the training program at Fort Benning. Funding required for travel and for the procurement of non-standard training materials was provided by LWL.

Successful completion of this project was due in large part to the cooperation, interest and high level of professional competence of the following members of the Military Dog Detachment, USAIS, Fort Benning, GA: LTC Robert Lomax, Jr., Commanding Officer; SSG's Donald Matheson, Jesse C. Hicks, and Alphonso G. Bolden; and SGT's Delmas R. Shipman and Michael A. Rice.

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INTRODUCTION

It has been determined within the Military Dog Program that it is both feasible and desirable to train military dogs for one or more secondary tasks. With the Army reverting to a "peacetime" status, multiple utilization of resources becomes necessary. Further, the concept of adapting combat-oriented systems to peacetime and civil assistance applications is common during such periods as this.

BACKGROUND.

In June 1972 elements of the Military Dog Detachment of the U. S. Army Infantry School were alerted for possible deployment to the flood disaster area of Rapid City, South Dakota. This organization had engaged in a similar mission in Mississippi following Hurricane Camille in 1969. Subsequently it was suggested by one of the authors (Mr. Montanarelli) that a number of infantry tactical dogs (scout, mine/tunnel or combat tracker) might be trained in body detection and recovery operations. This idea prompted an exchange of correspondence between USAIS and USALWL, which resulted in establishing the Body Recovery Project as a joint USAIS-USALWL project. Under the arrangement agreed to by USAIS and USALWL, the Military Dog Detachment would furnish dogs, trainers and training facilities, and would conduct the training at Fort Benning. The LWL would furnish technical assistance and funds for special training materials. It was also agreed that a strong effort would be made to complete the training and demonstrate feasibility within a period of four months.

OBJECTIVE.

The primary objective of this project was to determine the feasibility of training tactical dogs for body detection and recovery. As a secondary objective, provided that feasibility could be established, trained body recovery teams were to be made available for deployment. Dogs trained in this role, when properly used by experienced handlers, can greatly assist in the recovery of military/civilian casualties following natural or man-made disasters. Moreover, they can facilitate military operations by locating battlefield casualties. Specifically, the task required of an infantry tactical dog in the Body Recovery role is to locate human casualties in the aftermath of disasters such as floods, hurricanes, bombings, tornadoes, earthquakes, avalanches, etc., where recovery operations are hampered by water, mud, debris, collapsed buildings and so forth.

CONCLUSIONS

1. The training methods and behavioral reinforcement techniques used at the USAIS produced dogs capable of searching for and locating simulated human casualties under conditions closely approximating those that are apt to be encountered in the aftermath of a man-made natural disaster.

2. Human casualties were effectively simulated for training purposes by the use of clothing marked with simulated human odor (training odor).

3. German Shepherd dogs, trained originally as scout dogs, were more amenable to the training procedures used in this program than were Labrador Retrievers that were originally trained as trackers. It is assumed that the difference may not represent a broad difference so much as a difference in the kind of training to which the dogs had been subjected before entering this program.

4. The dogs that completed this training program, with their handlers, constitute body recovery teams with a unique and highly effective capability for searching out and locating human casualties under the most difficult working conditions. Four such teams are now available on a stand-by basis for employment in disaster situations. An additional benefit that may accrue from the use of body recovery dog teams in disaster situations may be that the presence of the dogs in an area may act as a deterrent to would-be looters.

METHODS AND PROCEDURES

DOGS.

In this program, fifty German Shepherd scout and mine/tunnel dogs and ten Labrador Retriever combat tracker dogs were evaluated as potential candidates for body recovery training. Of the sixty dogs, four German Shepherds and three Labrador Retrievers were selected. Of these seven, the three Labrador Retrievers were later dropped from the program because of training deficiencies.

PERSONNEL.

Project personnel consisted of the USAIS Action Officer and four experienced military dog trainers. Three were scout dog trainers and applied this experience to search and detection techniques. The fourth man, a combat tracker dog trainer, instructed the others in basic tracking techniques necessary during early training. The USALWL Project Officer provided guidance and frequent consultation, and recognized

civilian experts were consulted during the course of the work. Additional military personnel were utilized during the interim evaluation as needed for support purposes. Objective grading of t t runs during the interim evaluation was done by an impartial commi oned officer.

EQUIPMENT.

Approximately 150 sets of unserviceable fatigue and khaki uniforms, and 50 sets of new t-shirts and drawers were used as training aids. Six sheet and foam rubber, military, hand-to-hand combat mannikins were used in early training to simulate casualties. Two cases of Mason jars were used for discrimination training. Dog equipment consisted of Corfam collars, harnesses, 5- and 15-foot leashes, web 25-foot leashes, and at one point a shock collar with transmitter. Organic communications and vehicle support were utilized as required.

TRAINING MATERIALS.

Experience in Mississippi following Hurricane Camille demonstrated the need for a solution to the problem of conditioning the dogs to respond only in the presence of olfactory stimuli associated with a human casualty. Failing this, dogs might respond to recently worn or dirty clothing containing secondary cues, or to dead animals or buried food. This would unacceptably delay recovery operations while such responses were checked, and would also damage the credibility of the concept. A number of solutions were attempted and each is discussed below.

The ideal substance for training dogs to detect human bodies would be human cadavers or portions thereof. This is infeasible, however, due to legal and ethical considerations. Initially, in the training, body tissues from dead domestic animals were used. These did not entirely satisfy the training requirement, however, because it must be assumed that the odor of animal tissue differs from human. The problem was resolved, short of using human cadaver parts, by compounding a mixture of macerated tissues of laboratory primates with additional chemicals added to cause it more closely to resemble the desired odor. This material proved to be effective, particularly as it decayed in use. A principal drawback with its use was that the decay rate was quite rapid under the training conditions. Its odor, even when fresh, was so unmistakable that the dogs were able to distinguish it from decaying messhall garbage, commissary meat and dead animals found in a sanitary fill. Fifty six-ounce containers were utilized (see Figure 1).

ANIMAL HEALTH, CARE AND DIET.

The health, care and diet of the dogs were maintained according to standard military procedures. Since food reinforcement was used in the training, close observation of the dogs' weight was maintained by weekly weighing.

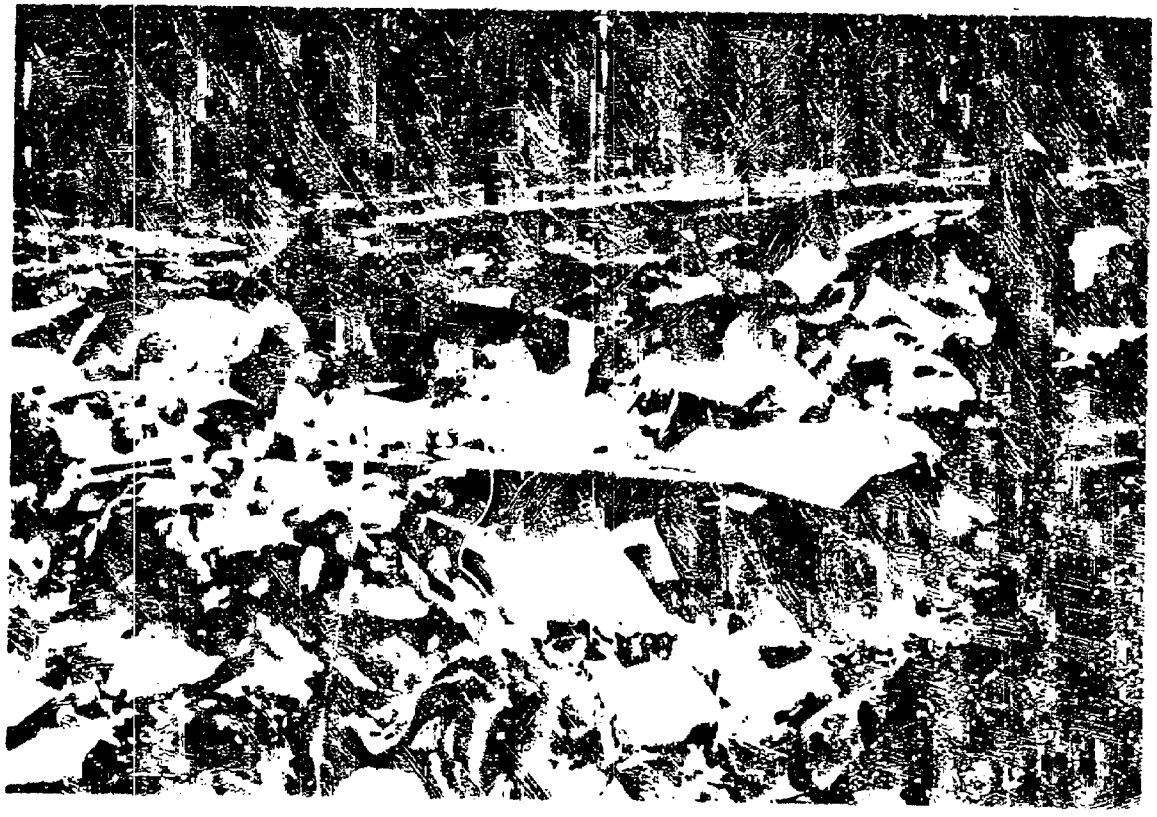


FIGURE 1. Body Recovery Dog Working in a Sanitary Fill.

SELECTION OF DOGS.

Because the concept of this project involved adding an additional skill to already-trained dogs, it was unnecessary to go through the selection procedures involved with new dogs.

Experience gained in other projects following the standardization of the USAIS behavioral conditioning technique indicated that an input of seven dogs could be expected to produce an output of four. Approximately equal numbers of German Shepherds and Labrador Retrievers were selected. It was thought that this would provide an opportunity to compare the performance of the two breeds. Additionally, it was thought that the Labrador Retrievers might excel at this type of work, since their primary training had been as trackers. The Labradors, however, began at a disadvantage; they had first to become accustomed to the training methods with which the Shepherds were already familiar. Two Labradors were rejected early because of their inability to adjust to the training methods. The third Labrador lasted through the tenth week, but was finally rejected because of its trainer's inability to break the dog of tracking.

It was concluded from this brief experience that dogs whose primary training has been as trackers may be unsuitable for this work. Additionally, although there is no objective evidence to prove this, there is some opinion that the same single-mindedness that makes the Labrador excel at a single task may make it unsuitable for training in multiple tasks.

TRAINING.

Dog/Handler Relationship. Since all the dogs were fully trained military working dogs and the trainers were familiar with the dogs on an individual basis, it was unnecessary to schedule a preliminary "get-acquainted" period.

Obedience. Military on- and off-leash obedience training was conducted daily.

Conditioning. In anticipation that future working conditions would place unusual demands on the dog's stamina and endurance, particularly on their feet (working in rough terrain, including deep mud as well as in debris, broken glass, etc.), a rigorous conditioning schedule was established. This included daily marches as long as ten miles over hard-surface roads, runs of one to three miles, and running the confidence course twice daily. Because it was initially thought that possible injury to the dogs' feet by debris, as well as working in deep mud, might present significant problems, standard military dog boots were procured and tried for protection of the dog's feet. These

boots proved to be unsuitable. Considerable effort was then expended in attempting to manufacture dog boots, but without success. As it turned out, however, the dogs experienced no difficulty with their feet in working in the most difficult environments. Figure 2 illustrates a typical search environment in which these dogs were trained to work.

Scheduling of Tasks. The training schedule outlined below was established and adhered to throughout the project:

Period	Activity
21-25 Aug	Selection of personnel and dogs
28 Aug - 8 Sep	Free-feeding phase
11-22 Sep	Food reinforcement conditioning Basic open field work Basic decoy finding Basic tracking exercises Basic debris training
25-29 Sep	Intermediate open field work Intermediate tracking Intermediate decoy finding Intermediate debris training
2-10 Oct	Discrimination training
11-13 Oct	Boot conditioning Basic mud training Field exercises
16-20 Oct	Boot conditioning Debris training (sanitary fill)
24-27 Oct	Debris training (salvage yard) Mud training (to 6 inches)
30 Oct - 3 Nov	Mud training (to 12 inches)
6-12 Nov	Advanced mud and water training (to 30 inches)
13-17 Nov	Building search
20-22 Nov	Building search (collapsed)
27 Nov - 1 Dec	Advanced building search
4-8 Dec	Full field problems (all tasks)

FIGURE 2. Body Recovery Dog Working among Building Debris. Note Up-Turned Nails.

Period	Activity
11-15 Dec	Continuing full field problems Lost person search
16 Dec - 2 Jan	Holiday
3-12 Jan	Recondition dogs
15-31 Jan	Evaluation.

Free-Feeding Phase. The free-feeding phase was initiated by establishing a weight chart for each dog. Accurate records were kept of food consumption. The dogs were weighed at the beginning of each work day and then were given access to as much food as they could eat. They were fed at the start and end of each day. On the first day each dog received two cans of dog food (one commercial, one horsemeat) and one-half can of military stress diet (MSD). If the entire amount of food was eaten on the first day, it was increased on the second day, and thereafter, until food was found left in the feed pan two hours after feeding. Food consumption was recorded after each meal.

Exercise was limited to twice daily during the free-feeding phase. Each period consisted of walking the dog for thirty minutes (fifteen-minute walk, ten-minute rest, fifteen-minute walk). Exercise and feeding were not, and should not, be done by the same person. Petting and praise, or any actions designed to establish a social relationship between dog and handler, must not take place during this period.

Food Reinforcement Conditioning. This period consisted of introducing the Labradors to the food reinforcement technique and refreshing the scout dogs. The procedure that has now become standard at Fort Benning was used. This method, although relatively new to military dog training, has long been used by animal behaviorists. In this method, the animal is conditioned to associate the appearance of food with a particular behavior such as the performance of a task or a response to a particular object or odor. The dog quickly learns that it earns food when it works. Failure to perform a given task correctly during a training session does not result in physical punishment, but only in withholding of food. This may seem overly simple, but since food is a most important motivator to the dog, the method is effective. Food reinforcement is most effectively used in training military dogs which must perform a variety of tasks, or where the task to be performed is quite difficult and apparently foreign to any special hereditary predisposition. Two categories of food are normally used in the Fort Benning training procedure:

1. Training Food. This is the food given the dogs as reinforcement for correct performance. A commercially-prepared soft-

moist dog food in the form of cubes or large pellets is used. The cubes must be easily handled and must not crumble when handled. Each handler requires one to two pounds of training food for his dog each training day.

2. Goal Food. Goal food is given after the last work session if the dog has performed well. For this purpose, a commercially-prepared, meat-based canned dog food which is especially appetizing to the dogs is used. At the completion of the last work session of the day, the dog is given the remainder (if any) of its prescribed daily ration of training food plus the goal food. If a dog has not performed well that day, it receives no goal food. The dogs quickly learn that they must perform well each day in order to earn their goal food. An important principle to observe in using food reinforcement is that the dog receives only the food that it earns. On non-working days all dogs receive a basic diet (free food).

Training Pens. Although not essential, the use of training pens facilitates the introduction of food reinforcement by isolating each team during a work session and by reducing the amount of training area required. There should be one pen per five teams in training; when necessary, as many as ten teams can work with one pen, but the number of trials per team will then be reduced. Each pen should be constructed of fence post material and 48-inch chicken wire. Dimensions should be ten feet wide by twenty to thirty feet long. One end should have a simple gate in it. If pens are unavailable, early conditioning must be performed with the dogs on leash.

The Reinforcer Word - GOOD. The word GOOD is used throughout training as a secondary reinforcer to inform the dog that it has performed an expected task properly and/or that food is about to appear. The word GOOD receives its reinforcing properties by being paired with the presentation of food, the primary reinforcer.

Conditioning of GOOD. Each handler wears his feed bag filled with training food. The feed bag is worn at the waist, in front of or on the right side. The handler takes his dog into the training pen, closes the gate, and removes his dog's leash. The dog then is allowed to roam about the pen for a few minutes to accustom itself to its surroundings. The handler then begins the conditioning to GOOD.

Step 1. Whenever the dog is near the handler, and especially if it is looking at him, the handler says GOOD; one-half second later he takes a cube of food from his bag and places it in his dog's mouth (see Figure 3). Correct timing is essential during this and all subsequent stages of conditioning. The procedure must always be: GOOD; one-half second pause, appearance of food. The handler must not give the dog any cueing signals, such as reaching toward the feed bag or bending over before the word GOOD is completed. This procedure is continued for

FIGURE 3. Positive Reinforcers: The Word GOOD Followed by Several Cubes of Food from the Handler.

several trials, until the dog starts watching its handler and waiting for food, or otherwise exhibits what is termed "begging behavior."

Step 2. The handler waits until his dog looks or moves away from him before saying GOOD, followed one-half second later by food as before. When the handler is sure his dog is responding to GOOD and not other signals, such as various body movements, he can begin "shaping" his dog's responses. Conditioning of GOOD is considered complete when the handler can "shape" the dog to move away from him with the word GOOD. Training time for the average dog is five to six trials, each lasting ten to fifteen minutes.

Exercise in Shaping Procedure.

Step 1. To shape the dog's behavior into a certain response, such as moving away from the handler, the trainer says GOOD whenever his dog looks away from him until the dog repeats "looking away" consistently.

Step 2. The trainer waits until his dog makes a slight move away from him before saying GOOD, and continues this until the dog repeats "starting to move away."

Step 3. The handler waits until his dog takes a step away, then several steps, or until the dog moves four or five feet each time, before saying GOOD and having the dog return for food.

Step 4. When the dog repeats "moving away," the handler may wait to say GOOD until the dog moves in a desired direction. The instructor must insure that the handler does not expect too much of his dog at one time. The handler may have to wait a long time for his dog to go accidentally to the right spot in the pen. He will have to wait again to get his dog to go continuously to that spot, and he must expect only slow results. During this phase of training some dogs will become confused, and many will constantly hesitate until they are sure they are performing the correct action. Many handlers will also become impatient or discouraged during this period, especially if they see other handlers' dogs progressing faster than their own. The instructors must constantly remind the handlers that each dog progresses at its own pace and encourage them to be patient. If a handler becomes disgusted or loses his temper, any benefit from the day's training may be lost.

Steps 5 and 6. One good technique for getting the dog to move to a certain spot in the pen is to "divide" the pen into progressively smaller sections. The handler should stand in the center of the pen. He may then reinforce his dog only when it is in that half of the pen to his front. Next, he may reinforce his dog only when it is in one quadrant, and so forth, until the dog continuously moves in only one direction. The handler constantly withholds reinforcement until his

dog gets a little closer to the desired spot, and expects a little more each time. Once the handler has his dog going to a particular spot, he must never reinforce his dog for doing less, such as going only halfway to the spot. Training time for the average dog is two or three ten- to fifteen-minute sessions.

Basic Training. During this period, the dogs were worked in open fields and light woods. Human decoys were used to simulate bodies. Initially they were mostly exposed, then partially concealed. The dogs were required to locate the decoys using the quartering technique, and sit near them. This caused some minor problems with the scout dogs, since it was necessary to overcome their previous conditioning not to approach human targets.

Concurrently with decoy finding, the dogs were worked on short, simple tracking problems, whereby a decoy made an obvious track and then lay down and hid to simulate a body.

The above training was intended to accomplish three primary objectives: Informing the dogs that their new task was finding motionless humans; teaching the scout dogs to work on ground scent as well as airborne scent; teaching the tracker dogs to work also on airborne scent. This third task proved too difficult to achieve in the allotted timespan.

Standard quartering search technique was used before the primate training material was available. This technique involves giving the team a roughly rectangular area to search. The handler works his dog into the wind in a zigzag pattern (see Figure 4). This pattern gives overlapping coverage of the area, using the wind to the best advantage.

After the primate training material was available, it was discovered that, due to the strength of its odor, the standard quartering technique could not be used. With any wind present, the dogs usually picked up the scent very quickly and worked toward it rather than following a quartering pattern. If more than one target was emplaced, the several scent cones apparently appeared as one to the dogs. This problem was eliminated by reversing the pattern and working with the wind, starting on the upwind side of the search area.

Dummies. During this period dummies were introduced to replace the human decoys. These were issue hand-to-hand combat dummies made of molded sheet rubber filled with foam rubber (see Figure 5). Recently-worn articles of underwear and fatigue uniforms were placed on the dummies, which were hidden in the same manner as the human decoys. As training progressed to the stage of using programmed positive and unprogrammed negative targets,* the dogs' performance indicated that the rubber smell was masking the human odor, so that the dogs had

* Programmed positive targets were targets with training odor associated with them; unprogrammed negative targets were without training odor.

FIGURE 4. Handler Working His Dog into the Wind in a Zigzag Search Pattern.

FIGURE 5. Simulated Corpse. Dummy with Human Scent.

difficulty in distinguishing positive and negative targets at a distance. When training odor was used with the dummies, they quickly became contaminated and could no longer be used.

Intermediate Training. Early intermediate training consisted of a continuation of open field work. The targets were now well concealed and some were hidden in light debris such as scrap lumber, tires, etc.

Discrimination Training. A standard scent discrimination method was used with the training odor. Initially, a container of the substance was placed in a training pen in plain sight; the dogs were taught to go to the container and sit, utilizing the procedure known as shaping. In this procedure, initially any random move the dog makes in the direction of the container with that training odor is reinforced by a food pellet and the word GOOD. After a few reinforcements of this first tentative movement in the desired direction, the dog must make a more definitive movement toward the odor source before reinforcement is given. Before long the dog moves directly to the odor source and then it may be reinforced only when it sits near the container. It next is a simple matter to conceal the container in gradual steps so that the dog eventually locates the odor source by smell only.

When the dog shows by its behavior that it recognizes the training odor source as the proper stimulus to make a sit response, it should then be presented with a choice situation. Empty containers, or containers with other odors (negative stimulus), together with one container containing the proper odor (positive stimulus), are arranged in such a way that the dog can readily examine each one. The dog is reinforced with food and the word GOOD only when it responds to the positive container. Next, scraps of clothing, some marked with training odor (positive), and others unmarked (negative), are substituted for the containers in the discrimination array until the dog responds only to the positive scraps.

In shaping, and discrimination training in general, correct and precise timing of reinforcement is extremely important. A dog is easily confused by poorly timed reinforcement, and much time can be wasted if this factor is not taken into account.

Debris Training. Considerable time was spent training in various types of debris, to simulate the aftermath of hurricanes, tornadoes, bombings, earthquakes, and floods. For the present purpose, debris was classified as inorganic and organic. Inorganic debris is that which is composed primarily of items other than human residue, dead animals or foodstuffs (cars, lumber, tires, furniture, etc.). Organic debris contains or consists of human residue, dead animals and foodstuffs, such as would be found in a sanitary fill or town dump. Training was conducted mainly in the Property Disposal Salvage Yard and at one of the sanitary fills (see Figure 6).

FIGURE 6. Training Conducted at Property Disposal Salvage Yard.

In early debris training, first decoys and then programmed dummies were partially concealed under debris found in the woods (windfalls, brushpiles, discarded junk). This accustomed the dogs to searching such areas for targets. Dummies, and later positive and negative fatigue scraps were concealed at the salvage yard in junk autos, junk piles, old tires, etc. When concealing fatigue scraps, a small portion was usually left exposed. This was intended to direct the dogs' attention to it by simulating an exposed piece of clothing on a human casualty buried in the rubble.

When working in the sanitary fills, positive and negative targets were concealed under or in a variety of trash and debris, often near collections of food scraps, dead animals and other decaying organic material. This training simulated the environment of a disaster area some time after the disaster. It proved an excellent test of the dogs' ability to distinguish the target odor from the numerous other strong odors present.

Mud Training. Training in mud and water was conducted to simulate the aftermath of a hurricane or flood, while the water is still receding. Most mud training was conducted along the Uchee Creek. Again, first dummies and later clothing scraps were concealed along the banks, in the mud and sand at the shoreline, and in the creek under as much as six inches of water. As in other training a portion of the target was usually left exposed. Along the shore and in the water, targets were buried under varying depths of mud and water and the mud was compacted to varying degrees, to test the permeation of the substance odor (see Figures 7 and 8).

In early November, training was conducted at the fish hatcheries at Auburn University, Alabama. Arrangements had been made to use a one-acre pond at the hatchery. The pond had been out of use for several years, and the water was stagnant. When drained the pond bottom was found to consist of mud as deep as 36 inches. This provided excellent training to simulate the aftermath of flooding. Targets were planted in the mud at depths of one to thirty inches, beneath a layer of water one to twelve inches deep. A problem developed at Auburn which, at the time, was thought to be minor, but subsequently had an impact on the entire training procedure. It was observed that the dogs did not want to sit in deep mud or water at the targets. The decision was made to eliminate the sit response and to rely on handler judgment based on his observation of the dog's behavior, to determine positive, negative and false-positive responses. This approach worked well at Auburn and for a while after returning to Fort Benning. Eventually, however, it was necessary to revert to the sit response (see Training Problems and Lessons Learned).

Advanced Training. Advanced training involved the most difficult search environments in three of the objective areas (field and woods, debris, and mud/water), plus building search training. This last had to be delayed until buildings that could be destroyed became available, since this training required collapsed buildings to simulate disaster aftermaths. Targets were hidden outside and inside the building rubble.

FIGURE 7. Standing Alert to Scented Clothing in the Mud.

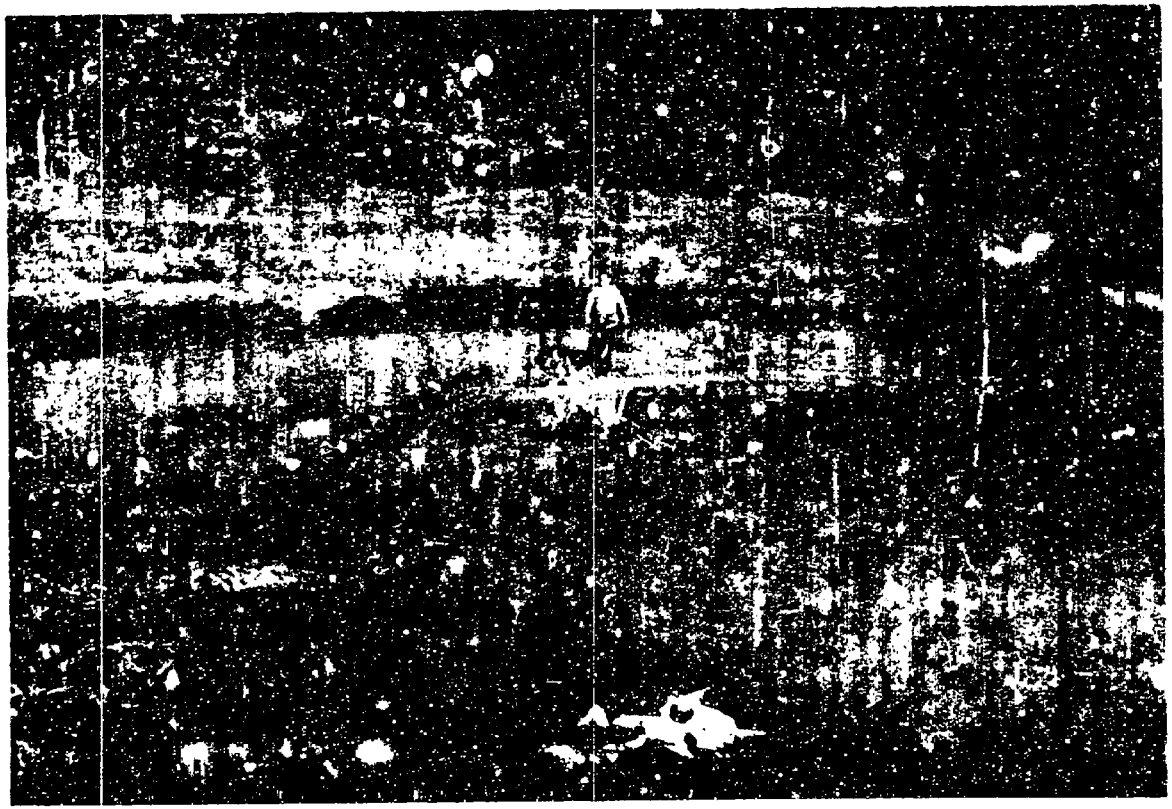


FIGURE 8. Typical Training Situations: Mud and Water.

INTERIM EVALUATION

An in-house performance evaluation was conducted toward the end of the training period to determine the dogs' state of proficiency, to identify problem areas and to develop employment techniques. A series of five tests was designed to simulate most potential working environments:

Test I. Inorganic debris (salvage yard).
Test II. Woods and fields.
Test III. Organic debris (sanitary fill).
Test IV. Mud and water.
Test V. Building search.

TEST I, INORGANIC DEBRIS.

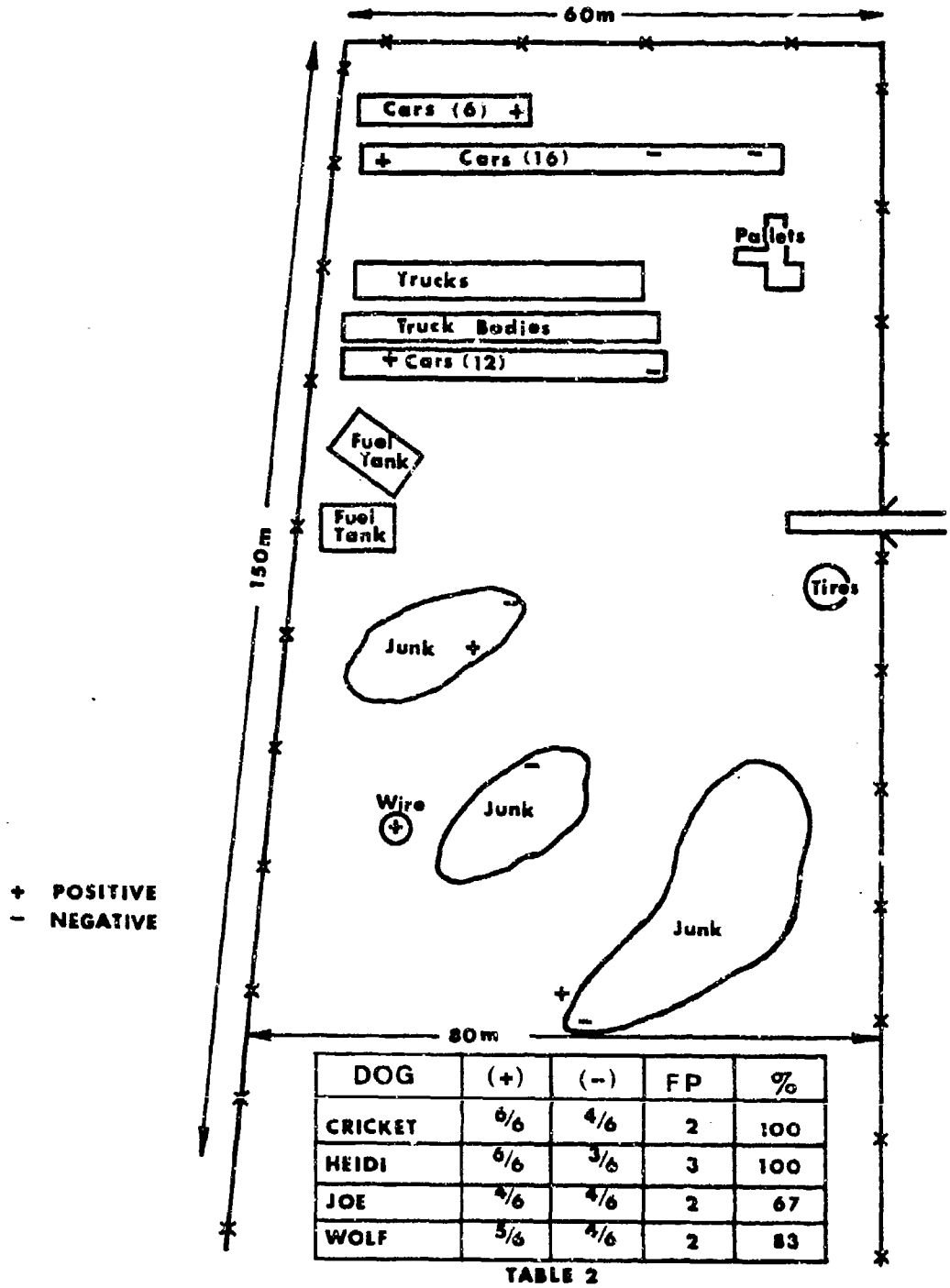
This test was conducted in the property disposal salvage yard. The test area was a fenced section approximately 75 meters by 150 meters containing about 60 wrecked autos and trucks and three large junk piles. The junk piles, ranging in size from 5 meters by 10 meters to 8 meters by 20 meters, and two to four meters high, consisted of furniture, lumber, training aids, wire and miscellaneous inorganic junk. The area was relatively free of recent human contamination. The test was conducted in two phases, one in the auto section and one in the junk piles. In each section, three positive and three negative targets were emplaced by non-project personnel, taking care to leave a minimum of secondary cues. All four dogs were run on the same targets. The results are shown in Figure 9.

TEST II, WOODS AND FIELDS.

This test was conducted in the "X" training area, in the southwest corner of the reservation. The test area was approximately 500 meters by 600 meters. The terrain was relatively level, containing small clearings, medium to heavy brush, tall grass and light woods. The area abounded in game trails and sign. Four lanes were set; non-project personnel planted three positive and three negative targets on each lane in the ground, with from 50 to 95 percent concealment. The results are presented in Figure 10.

TEST III, ORGANIC DEBRIS.

This test was conducted in the Sand Hill sanitary fill. The test area was a red clay plateau approximately 400 by 400 meters, with a 10 to 30 meter wide belt of inorganic and organic debris (see Figure 11). A 50 by 50 meter pile of organic trash was located near one end. At the bottom of one embankment was a pile of long-dead game. Both the trash pile and the dead animals produced extremely strong odors. Ten positive targets were emplaced, two per dog in the main debris belt, one in the trash pile and one in the middle of the scent cone from the dead



DOG	(+)	(−)	FP	%
CRICKET	6/6	4/6	2	100
HEIDI	6/6	3/6	3	100
JOE	4/6	4/6	2	67
WOLF	5/6	4/6	2	83

TABLE 2

FIGURE 9. Test I. Salvage Yard.

TABLE 3

DOG	(+)	(−)	FP	%	REMARKS
CRICKET	3/3	3/3	0	100	
HEIDI	3/3	1/3	2	100	
JOE	3/3	2/3	1	100	
WOLF	3/3	2/3	2	100	

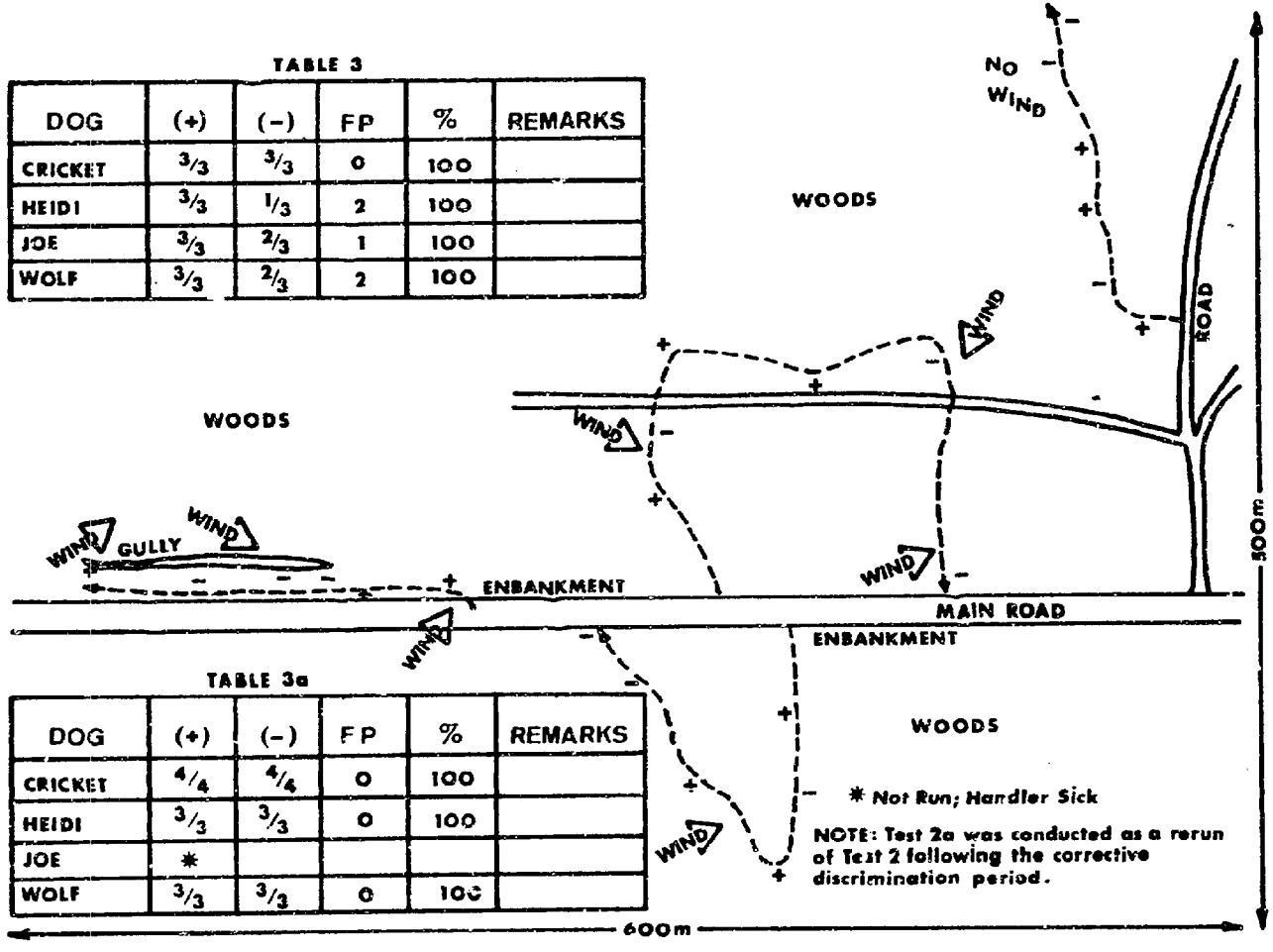


TABLE 3a

DOG	(+)	(−)	FP	%	REMARKS
CRICKET	4/4	4/4	0	100	
HEIDI	3/3	3/3	0	100	
JOE	*				
WOLF	3/3	3/3	0	100	

* Not Run; Handler Sick

NOTE: Test 2a was conducted as a rerun of Test 2 following the corrective discrimination period.

FIGURE 10. Test II. Woods and Fields.

FIGURE 11. Trash Pile Search and Standing Alert to Buried Targets.

animals. While the first lanes were being run, a dump truck arrived and dumped its load on the trash pile burying the target in that area under three feet of trash. Although a new target was then emplaced, all four dogs gave strong responses in the area of the first target; additionally, they gave false positive responses to an unknown stimulus at the other end of the pile. The results of Test III are shown in Figures 11 and 12.

TEST IV, MUD AND WATER.

This test was conducted along the Uchee Creek. Due to a lack of accessible areas, the test was confined to a 150 meter stretch of shoreline. The creek was shallow at this point, with a sandbar along the near shore (see Figure 13). The current was about five miles per hour. The beach, about ten meters wide, was mostly wet sand of a near-quicksand consistency. Two lanes of three positive and one negative targets each were emplaced along the shore, one per two dogs. All but one of the targets were placed within one foot of either side of the waterline, under as much as two inches of water, except for the last target. The last target was emplaced in an eddy pool under one foot of muddy water. The results are shown in Figure 13.

TEST V, BUILDING SEARCH.

This test was conducted on the site of an old wooden target building. The building measured 25 by 75 feet. The dogs at this time had received no training in building search. The building was destroyed on the morning of the test. Four positive and four negative targets were planted in and around the building rubble. The results are shown in Figure 14.

TRAINING PROBLEMS AND LESSONS LEARNED

This section discusses significant training problems encountered and lessons learned which may be of value in any future training of body recovery dogs.

TRAINING ODOR.

The selection of a suitable training odor was the single most important factor. During the project, training stimuli that were used included human decoys, domestic animal tissues, rubber dummies, clothing with human odor, and clothing with artificial training odor. Switching from one substance to another is confusing to the dogs and unproductive. It delays training while the dogs are being conditioned to the new odor.

USE OF WIND.

Several standard scouting techniques that involve using the wind had to be abandoned or modified. The usual practice is always to work into the wind. Attempts to work body recovery dogs with quartering technique showed that under most conditions the dogs should work with the wind.

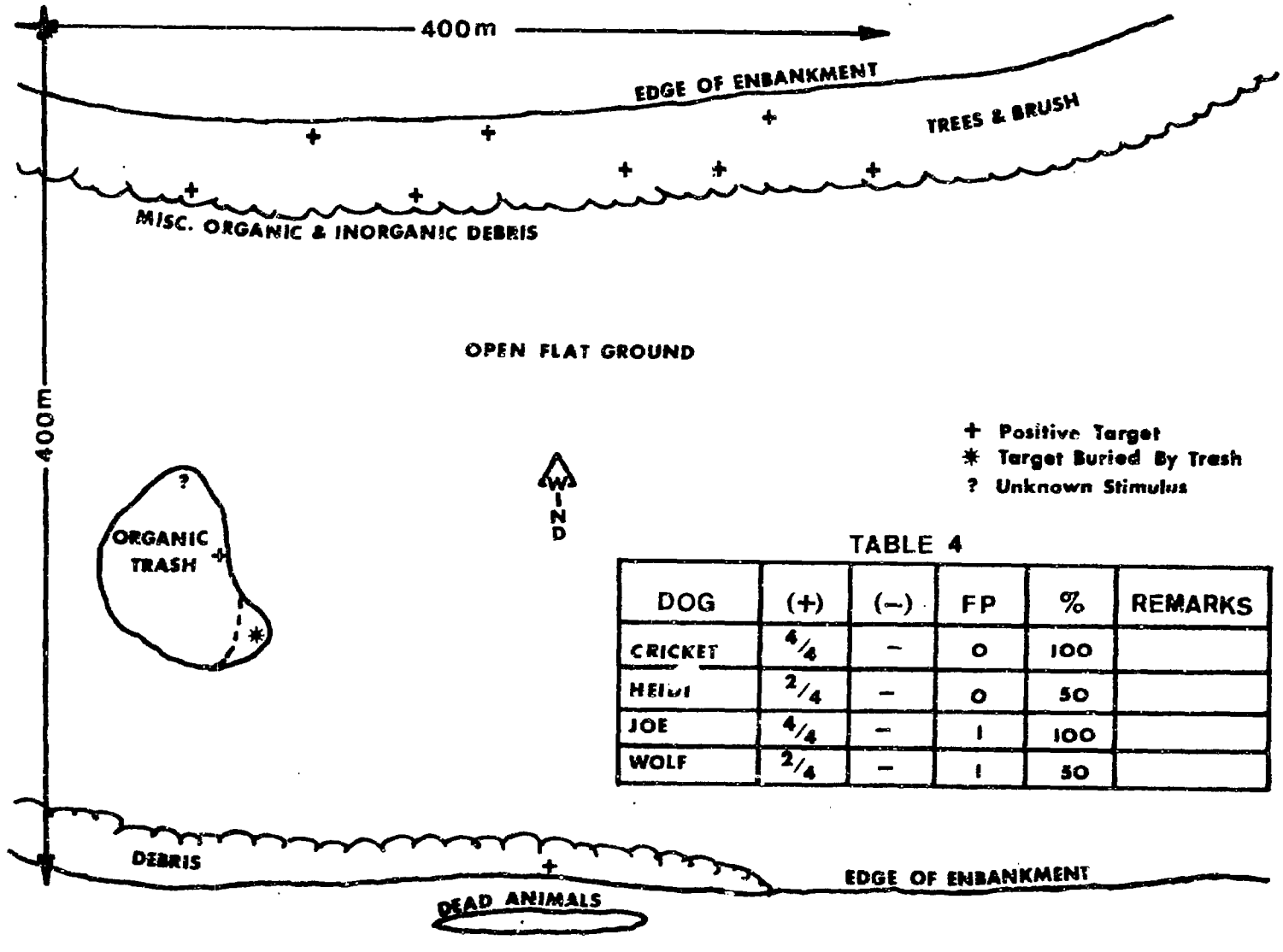


TABLE 4

DOG	(+)	(–)	FP	%	REMARKS
CRICKET	4/4	–	0	100	
HEIDI	2/4	–	0	50	
JOE	4/4	–	1	100	
WOLF	2/4	–	1	50	

FIGURE 12. Test III. Sanitary Fill.

TABLE 5

DOG	(+)	(-)	FP	%	REMARKS
CRICKET	4/4	3/8	0	100	
HEIDI	4/4	1/8	0	100	
JOE	3/4	8/8	0	75	
WOLF	4/4	7/8	1	100	

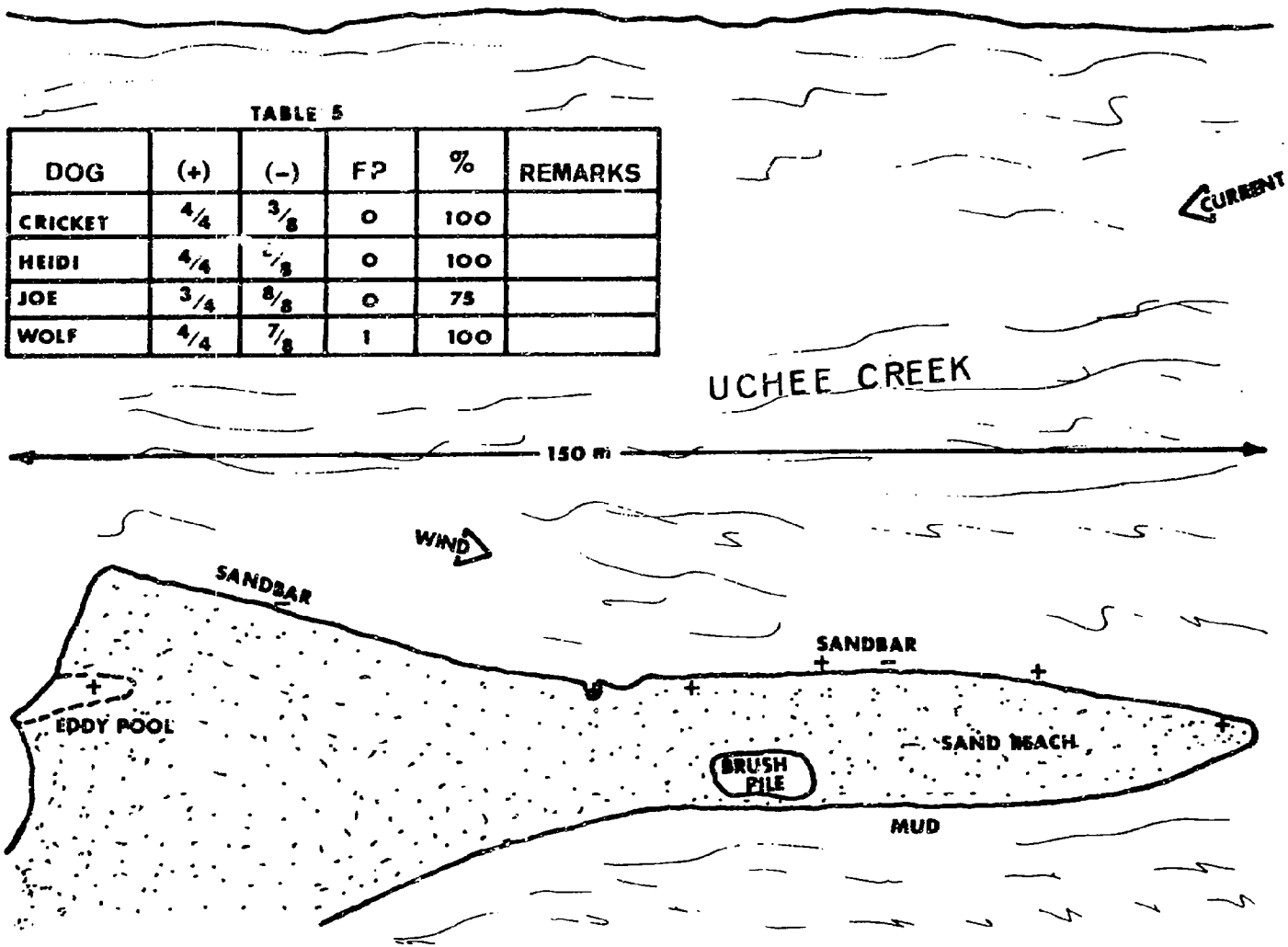


FIGURE 13. Test IV. Mud and Water.

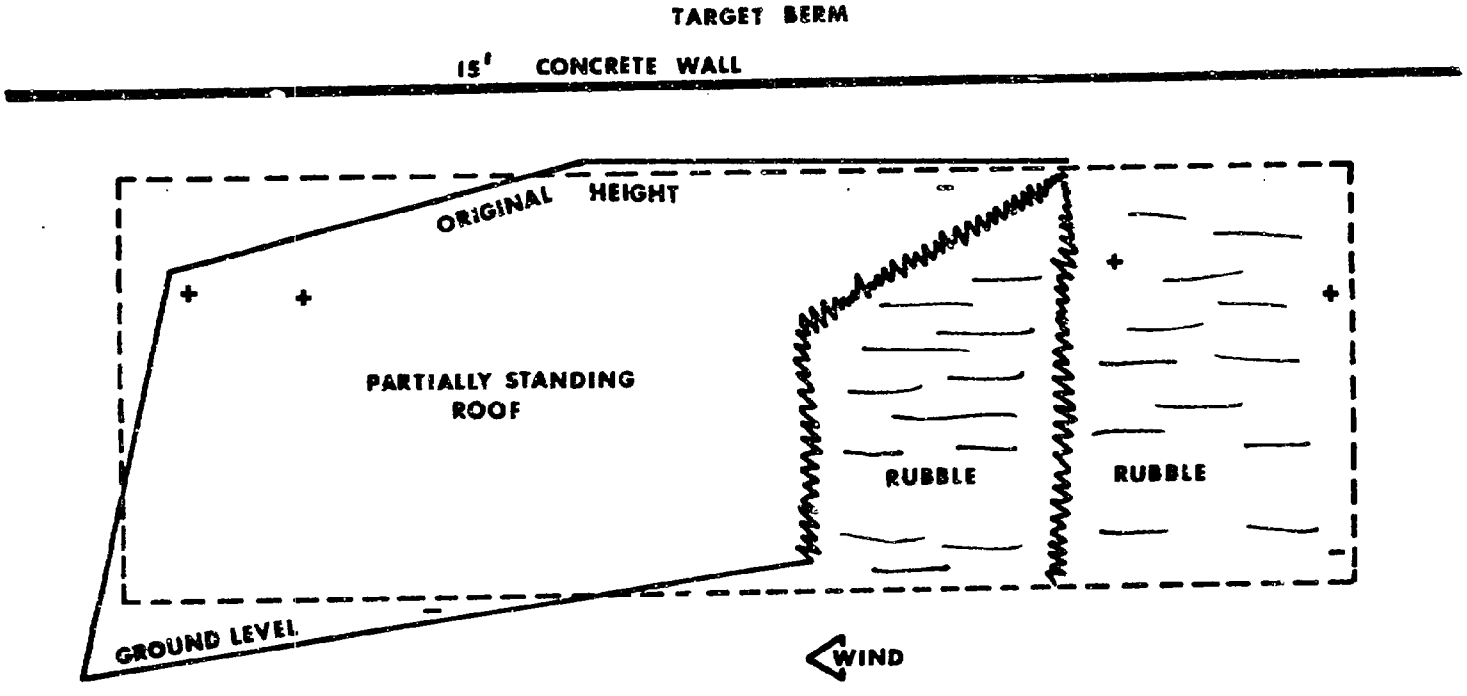


TABLE 6

DOG	(+)	(-)	FP	%	REMARKS
CRICKET	3/3	1/1	0	100	
HEIDI	2/3	1/1	0	67	
JOE	2/3	1/1	0	67	
WOLF	3/3	1/1	0	100	

PARTIAL DESTRUCTION

ORIGINAL BUILDING OUTLINE

BUILDING OUTLINE AFTER DESTRUCTION

FIGURE 14. Test V. Building Search.

Experience in the sanitary fill showed that some conditions might call for working across the prevailing wind, or in a random pattern. Consequently, the handler must base his search technique on the conditions existing in the area to be worked. Some general guidance criteria were established, taking into account the size of the work area, wind direction, wind strength, condition of the area, timespan between the disaster and the team's arrival and distractions present.

DOG EQUIPMENT.

A variety of standard and experimental military dog equipment was used while working the dogs, including leather working harnesses; Corfam collars; leather, nylon, Corfam and web leashes in five-, fifteen- and twenty-five-foot lengths; and a shock collar with transmitter.

Harness and Collar. The harness is normally worn by all infantry working dogs when working. Changeover to the harness from the collar informs the dog that it is time to work. The harness gives the handler more physical control of his dog in critical situations than the collar; it also gives the dog more freedom of movement, and in most working environments, is less likely to catch on obstacles. In environments such as water and building debris, however, the collar was found to be more snag-free. During building training, it was found that where there is extensive heavy debris, with nails and other sharp objects protruding, even the collar would snag. In these situations the dogs were worked with no equipment on; this did not seem to affect their performanc any way.

Leashes. Under various conditions, the dogs were worked with t five-, fifteen- and twenty-five-foot leashes and off-leash. Off-l employment is preferable in most circumstances because it allows t. more freedom to work and enables it to cover a much wider area. Th. leash is used under the following conditions: During training when dog is not obeying its handler off-leash; where the work area is sma. and/or restricted by debris or obstacles; when there is danger of the d falling into a hole or other hidden trap in the debris; when many people are present; when noisy equipment or other distractions excite the dog; when lack of wind or variable winds cause the dog to work aimlessly.

Shock Collar. A commercial shock collar was used with one of the dogs that was difficult to control off-leash. Under the supervision of the Chief Instructor, the dog was worked several times with the shock collar. Close supervision is required with a shock collar, since improper use by inexperienced personnel can adversely affect the dog's performance. After being shocked several times for disobedient behavior, the dog began to work properly off-leash. Then, during a stake-out period between trials, the dog began jumping and crying, as if shocked, for no apparent reason. Investigation showed that the transmitter had been left next to a radio transmitter, which was set on 41.65 MHz. Every time the radio handset was keyed for transmission, it activated the shock collar transmitter. It was feared that this would have an adverse effect on the dog's state of training, but fortunately this was not the case.

SIT RESPONSE.

When an attempt was made to substitute handlers' observations of their dogs' behavior as a basis for judging target detection, in place of requiring the dogs to respond to a target by sitting, two factors became obvious. The handlers were not able consistently to judge their dogs' behavior accurately enough to know when to reinforce with food, and this tended to confuse the dogs with resulting decrease in proficiency. This resulted in poor performance and an excessive number of false positive responses during Tests I and II. Testing was suspended while the handlers spent several days on basic discrimination and sit response reinforcement until the problem was corrected. This experience emphasized the fact that the sit response provides dog handlers with an unmistakable signal that their dogs have located the stimulus they were trained to detect. Although handler judgment is important, and is especially necessary in training, judgment is not always reliable under the stress of operational conditions.

EMPLOYMENT IN MUD AND WATER.

Two distinct primary search areas can be defined within a flood disaster area, depending on the state of flooding:

(1) Water Standing or Rising. Where the water level is constant or rising, the primary search area is in the water, bounded by a line at which the combined mud/water depth is six inches to a line where it is fourteen inches (see Figure 15).

(2) Water Receding. In this case the primary search area will move with the water. It will be a zone between the lines where the mud or mud/water is six inches deep to where it is fourteen inches deep (see Figure 16).

Six inches is considered the minimum depth of mud and/or water which can conceal a human casualty. Fourteen inches is the depth where the water reaches the chest of the average dog. Beyond this depth the dog will flounder or try to plunge or swim.

FINAL EVALUATION

In the final evaluation three tests were designed to demonstrate operational readiness.

TEST I. Debris.
TEST II. Open Field.
TEST III. Building Search.

TEST I. DEBRIS.

This test was conducted using the Sand Hill sanitary fill (see Figure 17). The test area consisted of a red clay plateau about 700 meters by

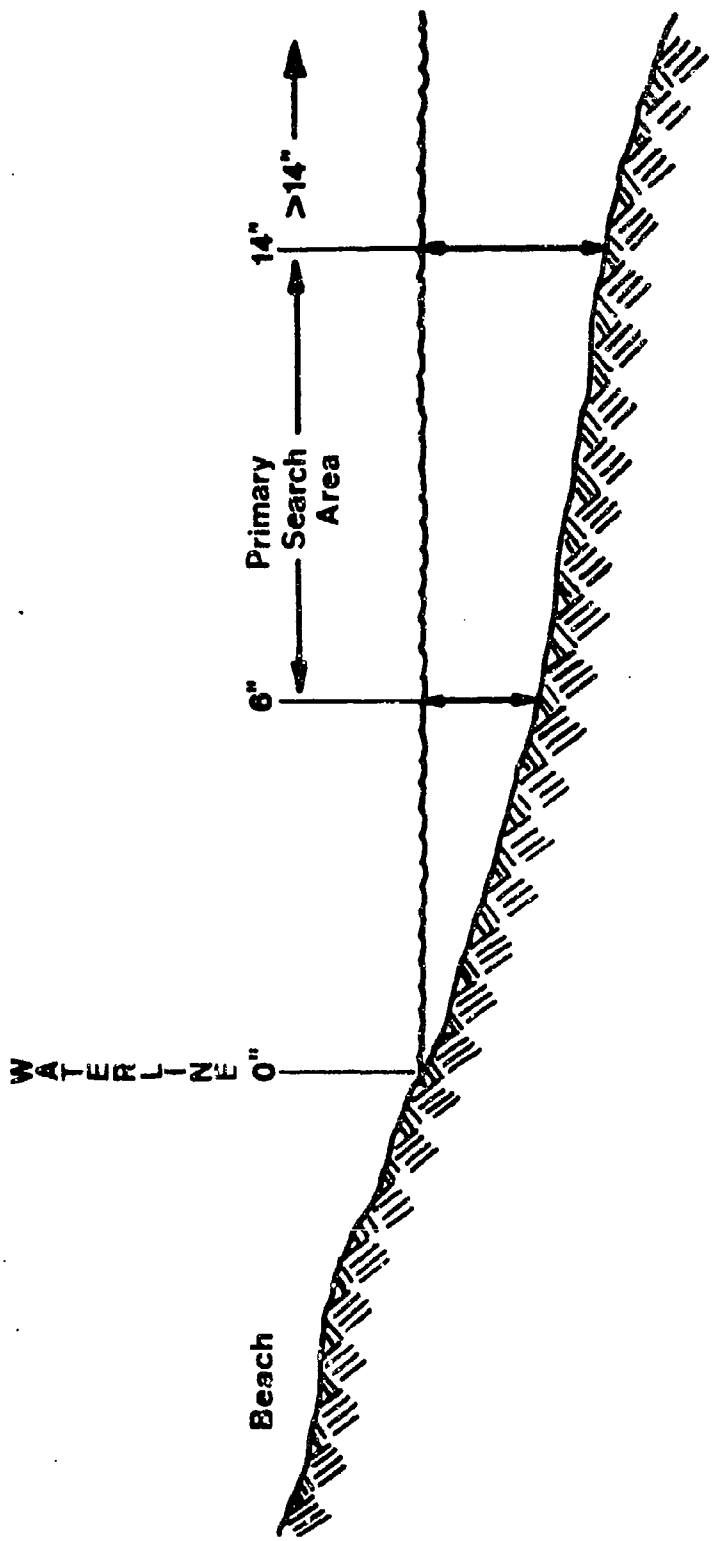


FIGURE 15. Water Standing or Rising.

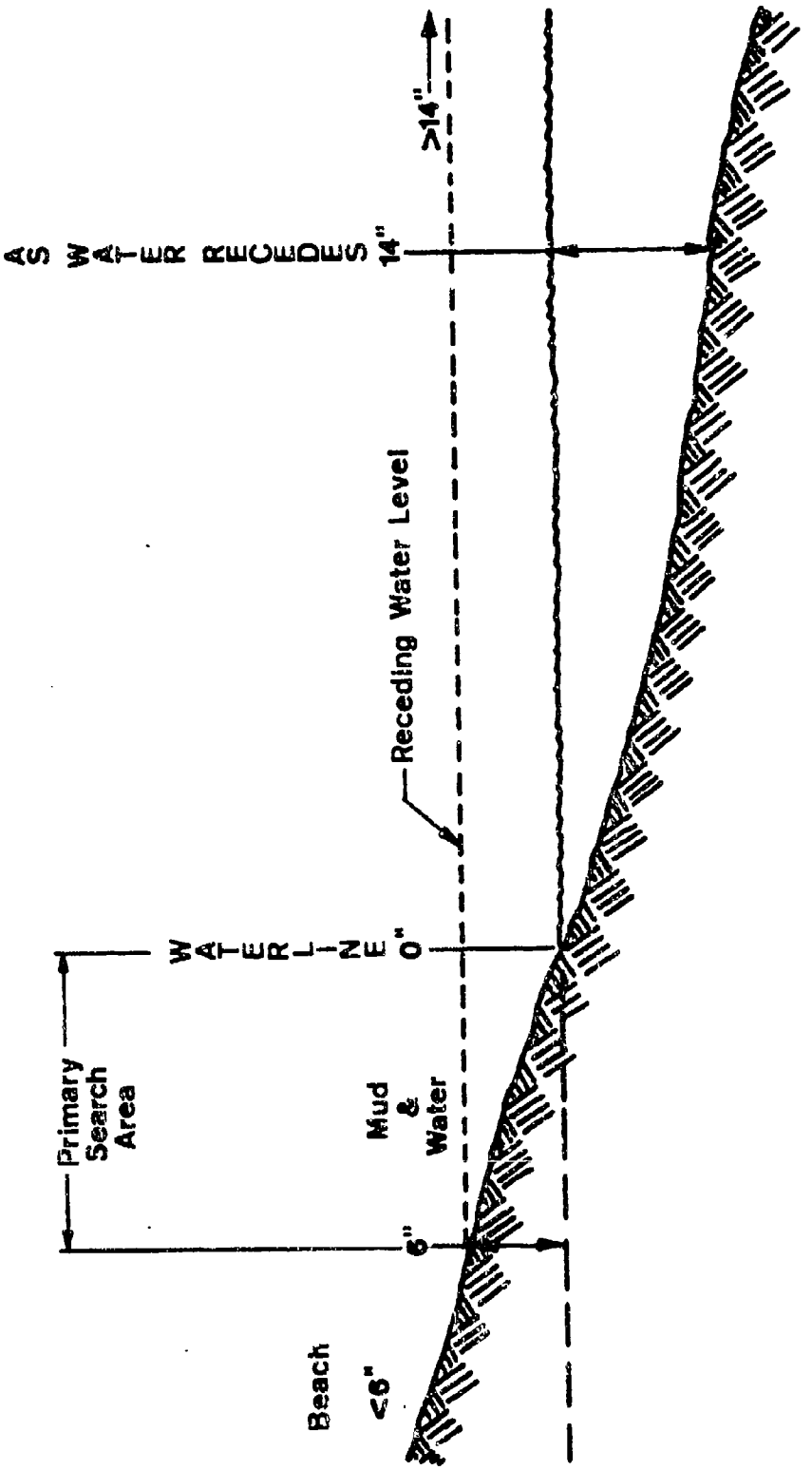


FIGURE 16. Water Receding.

TABLE 7

DOG	(+)	(–)	FP	%	REMARKS
CRICKET	5/5	–	0	100	
HEIDI	5/5	–	0	100	
JOE	5/5	–	0	100	
WOLF	5/5	–	0	100	

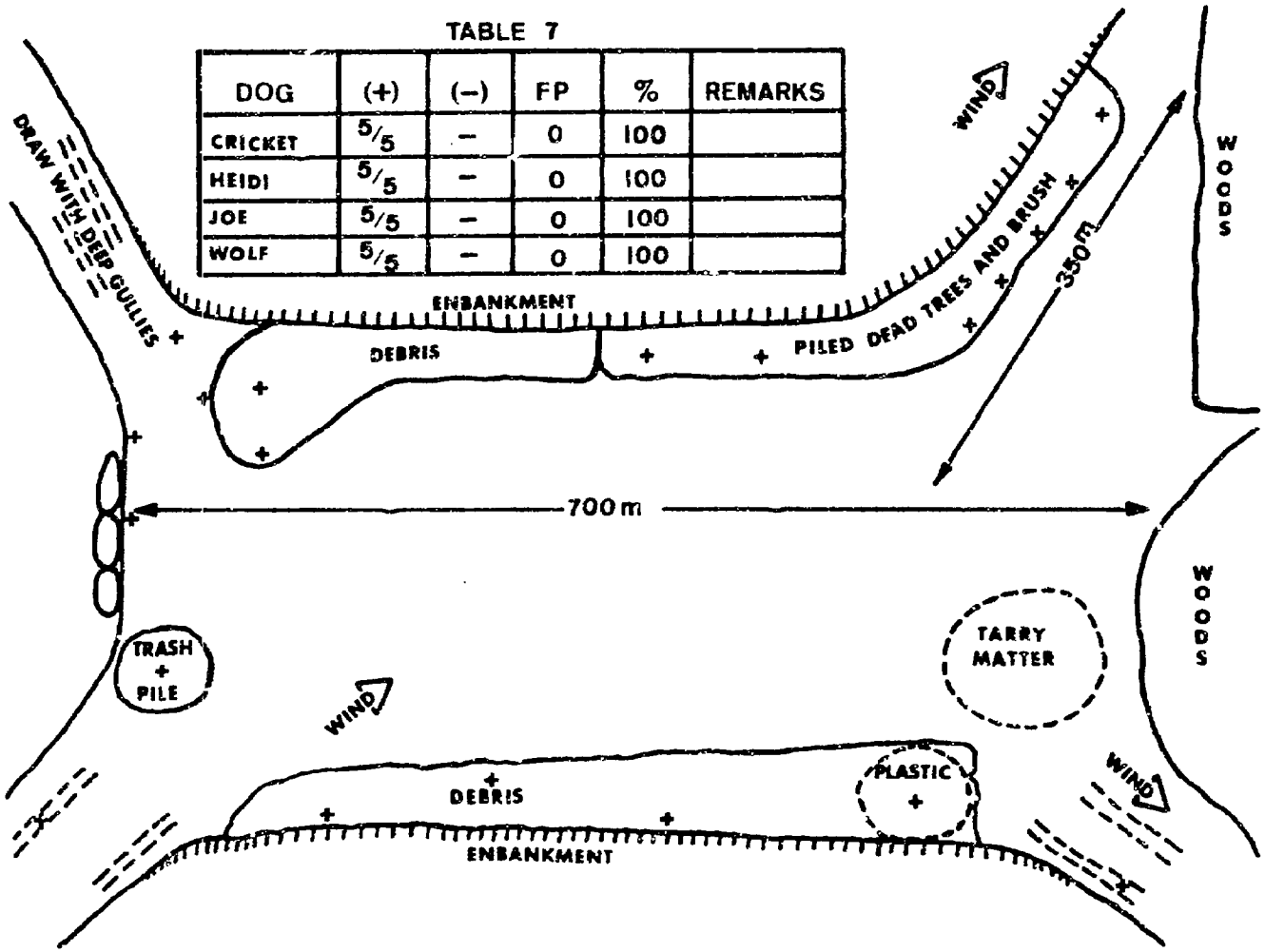


FIGURE 17. Final Test I. Sanitary Fill.

by 400 meters, bounded by embankments on three sides. At three corners were gullies with deep washed-out areas. At the edges of the plateau were three distinct belts of debris, from ten to fifty meters wide. The largest belt contained dead trees and brush, piled as much as twenty feet high. Adjacent to this was a belt of mainly inorganic wooden debris, with some organic trash. The third belt was mainly inorganic concrete, metal and plastic materials. Near one end of the plateau was a trash pile about 15 meters in diameter and one to two meters high, containing fresh organic trash. Twenty positive targets were emplaced around the perimeter, in four five-target lanes. The targets, emplaced about four hours before the test, were totally concealed in locations that required the dogs to negotiate obstacles. The results are shown in Figure 17. The trash pile provided the most significant demonstration of the dogs' ability to discriminate the target odor from other strong odors. In the center of the pile was a large quantity of hospital trash, including used bandages, sheets and miscellaneous materials. A target containing about two ounces of training odor was buried twelve inches deep in the center of this mass. The behavior of one dog in particular in this situation is worth noting. When the dog reached the trash pile, it investigated the area for fully fifteen minutes. Several times it stopped, as if to consider the situation, started to sit, but then changed its mind. After much encouragement from its handler, the dog finally dug down to the target and dragged it out with its teeth before sitting.

TEST II, OPEN FIELD.

The test area consisted of a flat, open field about 400 meters by 500 meters, covered with grass and weeds one to three feet high, with occasional dense briar or brush patches. Four three-target lanes were emplaced approximately sixteen hours before the test. The results are shown in Figure 18.

TEST III, BUILDING SEARCH.

The test area consisted of about twenty condemned, demolished and partly-demolished World War II wooden barracks and office buildings. All of the buildings and foundations contained large quantities of inorganic debris. Four four-target lanes were emplaced approximately sixteen hours prior to the test (see Figure 19). The results of this test were particularly significant in that it was conducted in a moderate to extremely heavy rainfall. The test had to be cancelled after the third target of the fourth run, when the rain became too heavy to continue. Despite the rain, all four dogs worked exceptionally well. The results are summarized in Figure 19. Figures 20 and 21 show dogs searching through building debris.

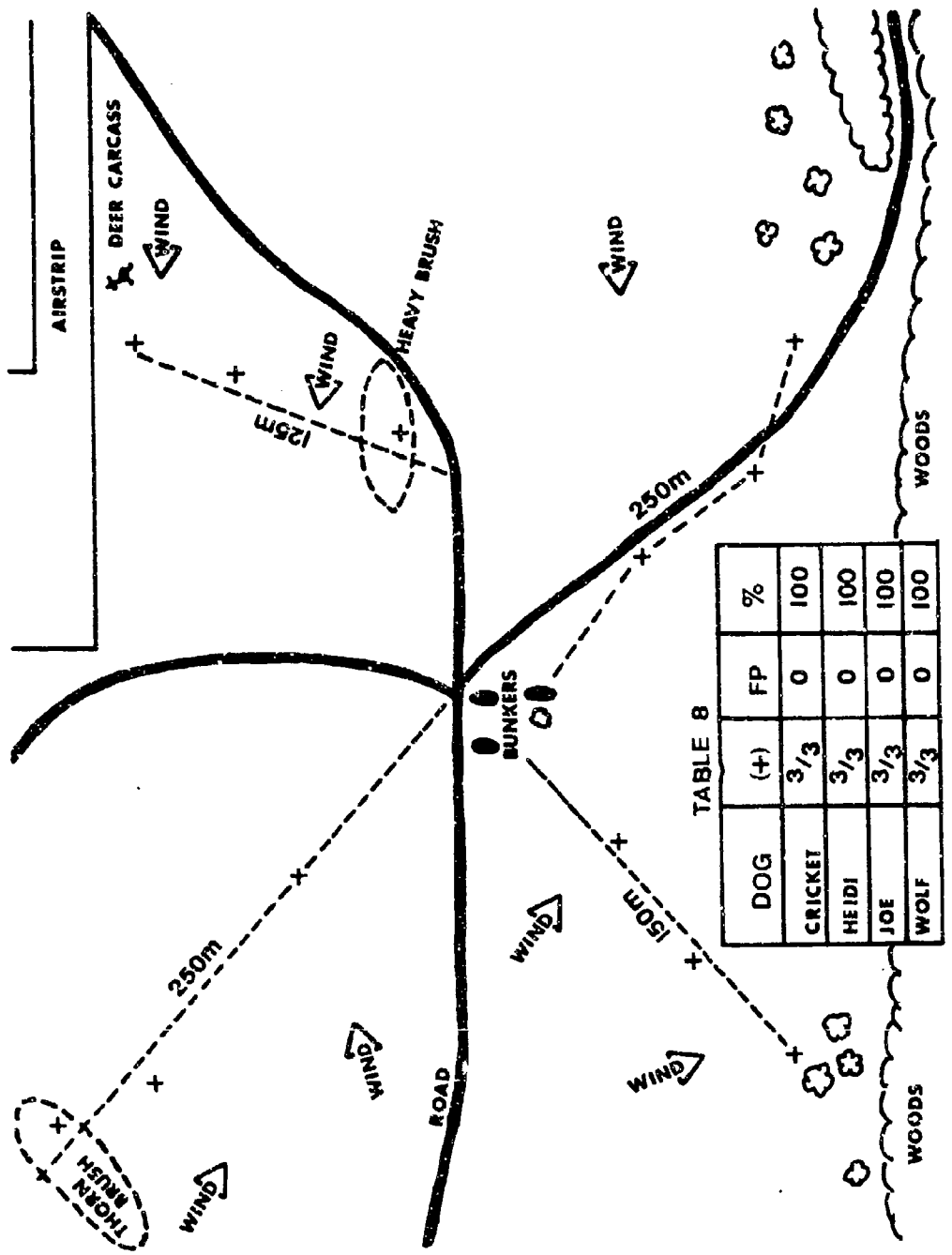


TABLE 8

DOG	(+)	FP	%
CRICKET	3/3	0	100
HEIDI	3/3	0	100
JOE	3/3	0	100
WOLF	3/3	0	100

FIGURE 18. Final Test II. Open Field.

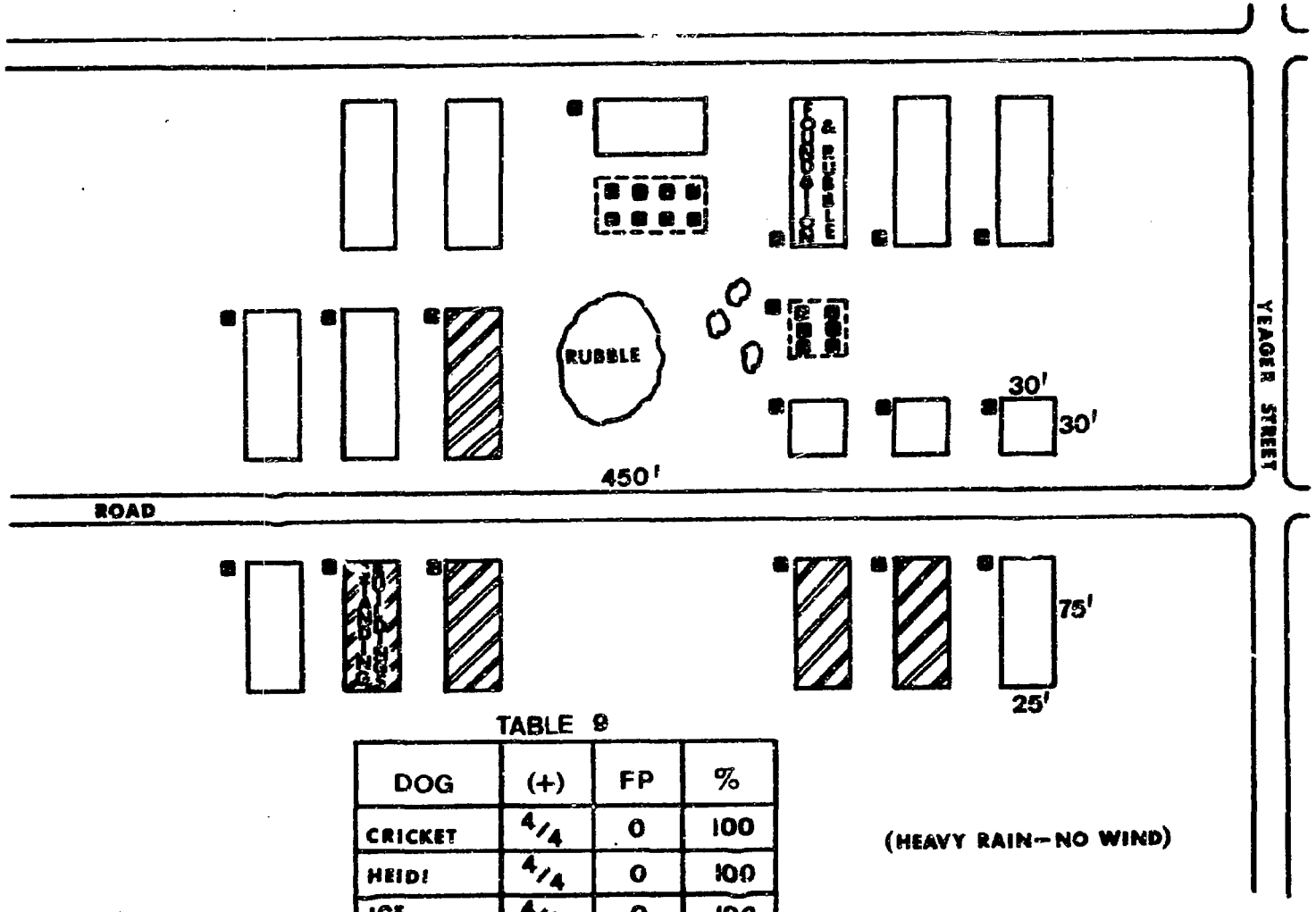


TABLE 9

DOG	(+)	FP	%
CRICKET	4/4	0	100
HEIDI	4/4	0	100
JOE	4/4	0	100
WOLF	4/4	0	100

(HEAVY RAIN—NO WIND)

FIGURE 19. Final Test III. 1300 Block.

FIGURE 20. Searching Building Debris.

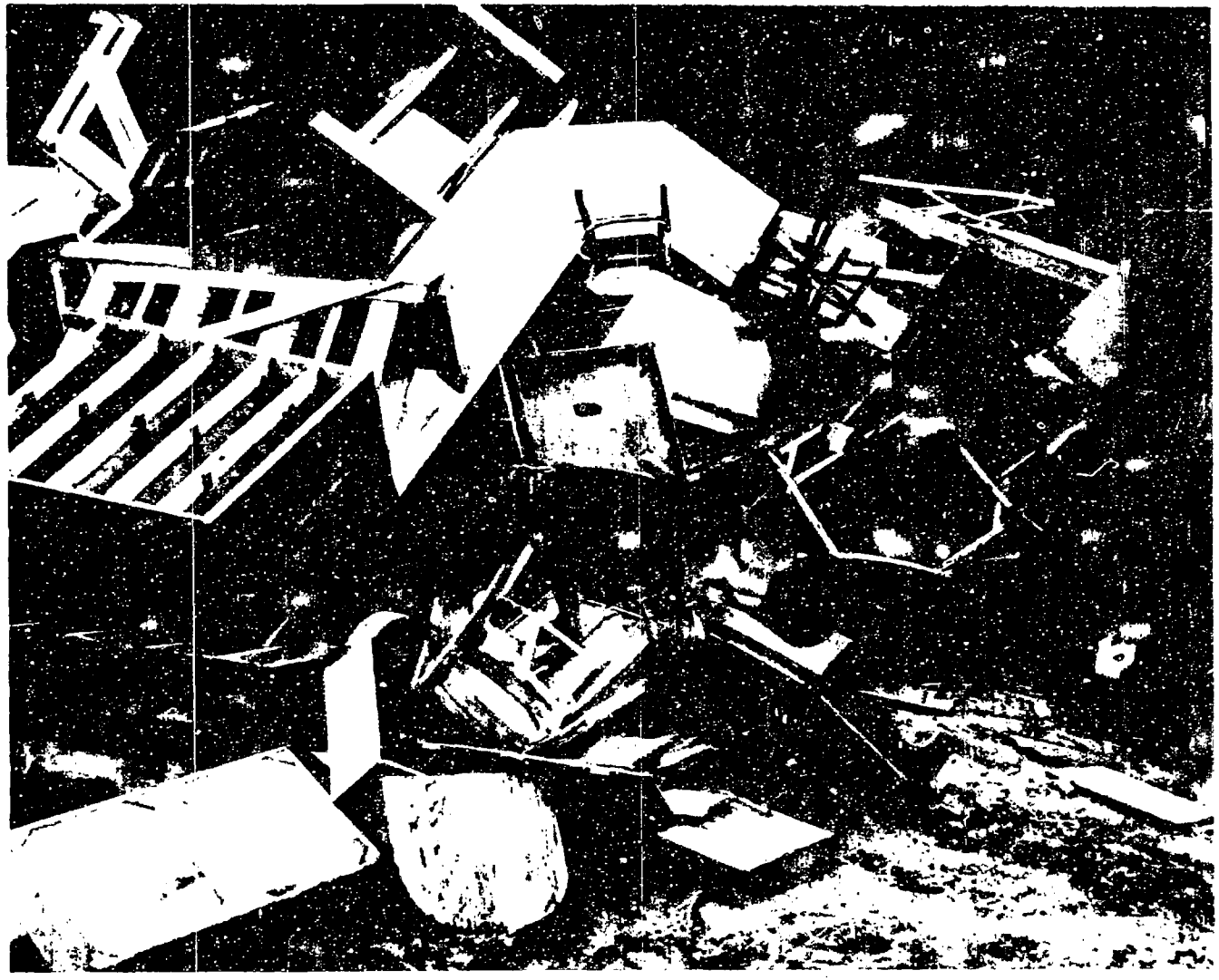


FIGURE 21. Searching Building Debris.

SUMMARY OF TEST RESULTS

The results of all tests, including the interim and final evaluations, are summarized in Table I.

TABLE I.
RESULTS OF ALL TESTS.

Dog	No. Targets	No. Found	Percent Found	False-Positive Alerts
Cricket	32	32	100	2
Heidi	32	29	91	5
Joe	32	28	88	4
Wolf	32	29	91	6
TOTAL	128	118	92	17

It can be seen from the table that the performance of the four dogs tested ranged from 88 percent to 100 percent of targets located, with an average of 92 percent.

APPENDIX

THE SELECTION OF DOGS FOR USE AS MILITARY WORKING DOGS

Criteria Employed by the Armed Forces*

Behavioral considerations that are particularly important in the training and utilization of military working dogs will be discussed briefly here. In the Body Recovery Dog project, standard military selection criteria, unless otherwise noted, were used in selecting dogs. Many factors influence the behavior of a military working dog and must be taken into account in selecting dogs for military use. These factors include hereditary and environmental influences. The behavioral characteristics that are essential in a military working dog are discussed below in terms of sensitivity, energy, aggressiveness, intelligence and willingness.

Sensitivity. The term "sensitivity" refers to the type and degree of response a dog shows to a certain stimulus. The oversensitive dog may be startled by a stimulus that would evoke only a mild response from an insensitive dog. The response of the oversensitive dog is often one of shyness or fright; the insensitive dog responding to the same stimulus might merely turn its head or show no response at all. Sensitivity of sound and touch are completely independent of one another. For this reason, the sound of a gun may actually hurt a dog's ears and yet a slap with the hand may not bother it. In selecting a dog team, the characteristics of the handler should be matched with the sensitivity of the dog. Certain men lack the proper range or tone of voice and are unable to appeal to a dog successfully through its hearing. However, these same men may be excellent in handling a dog manually because of a certain fitness in muscular control and coordination. There should be no difficulty in rating a dog's response to stimuli, and, from a practical standpoint, this rating becomes helpful. The handler can form a definite opinion about the response his dog shows toward the stimuli of sound and touch during normal day-to-day contact with the dog.

a. Oversensitive dogs. If the dog reacts excessively to a given stimulus, it may be oversensitive. An oversensitive dog is so handicapped that it is not likely to demonstrate its intelligence in a usable form. A dog which is oversensitive to either sound or touch, or both, is difficult to train and is usually considered unreliable. A dog that is oversensitive to sound may bolt at the sound of a gunshot. A dog that is oversensitive to touch may lie down and shake all over, as if frightened, when it is petted.

*Extracted from FM 20-20, Basic Training and Care of Military Dogs, HQ, Department of the Army, July 1972.

b. Insensitive dogs. A dog that is insensitive to both sound and touch is difficult to train. A dog that is insensitive to sound may not react at all when the stern admonition NO is used. If it is insensitive to touch, it may not react at all when the handler pets it. A dog insensitive to either sound or touch, but not to both, can be instructed readily enough if the handler uses the correct approach. In such a case, the handler uses either his voice or his hand, whichever is appropriate.

c. Moderately sensitive dogs. A moderately sensitive dog is somewhat sensitive to both sound and touch. With proper training, this dog responds willingly to hand gestures and vocal commands. It is trustworthy, willing, and ready to obey the given commands. The wisdom with which this dog is handled is the deciding factor in how well it performs. Properly trained, this dog is the ideal military dog.

Energy. Dogs differ not only in their degree of sensitivity but also in the degree of energy they show. A dog's behavior with regard to energy is quite evident. The term "energy," as used here, refers to the degree of spontaneous activity of the dog -- the speed and extent of its movements in general, not in response to any certain command. Dogs differ widely in the degree of spontaneous activity exhibited, and the task of rating them is easier in this respect than that of rating for other functional traits. Different dogs show two extreme degrees of energy -- one dog is the shiftless, lazy animal which shows no energy whatever unless required; the other is the animal that seems eager to move, wants to be active, and seems to be always on the go. Above-average energy is not particularly necessary for military purposes, but a dog that possesses this trait can be trained to control some of its extra energy. A dog that shows little or no energy is difficult to train and should not be accepted for duty.

Aggressiveness. A dog that is energetic is not necessarily aggressive. There are three general degrees: overaggressive, unaggressive, and moderately aggressive. Each dog must be classified for aggressiveness to determine what action is necessary to decrease its aggressiveness, increase it, or perhaps maintain it at a constant level.

a. Overaggressive dog. When an overaggressive dog sights a decoy, it usually becomes greatly excited, lunges at the end of its leash, and continues to lunge after the decoy disappears. Caution must be exercised while working with an overaggressive dog because it may attempt to bite anyone within reach during a period of excitement. Training procedures are designed to control, rather than arouse, the overaggressive dog.

b. Unaggressive dog. This animal reacts negatively to the approach of a decoy. It may stand still, wag its tail, throw itself on the ground, or try to run away from the decoy. Training procedures consist of exercises which tend to develop confidence and courage in the unaggressive dog.

c. Moderately aggressive dog. The ideal military dog is moderately aggressive. A moderately aggressive dog is the easiest to train. Upon seeing a decoy it becomes alert, shows suspicion of the decoy, and exhibits an eagerness to move toward the decoy. The majority of German Shepherd dogs fall into the moderately aggressive category, and normal training procedures are based upon this type of aggressiveness. It is, however, necessary to make fine distinctions as to the degree of "moderateness" necessary for a particular task. In this case, the dog must be "aggressive" in that it is bold enough to overcome extremely difficult working environments while doing its job, yet "unaggressive" in that it will tolerate working among large numbers of strange humans. The same distinctions may be made regarding sensitivity.

Intelligence. Generally, intelligence is the trait most closely related to a dog's success in training for work. Among the lower animals, the dog is rated as highly intelligent. A dog can be taught to respond correctly to a large number of spoken words. Only a few words are needed under ordinary working conditions, but some dogs have been known to respond to over 100 oral commands. A dog's rating for intelligence is based upon its ability to retain and use what it has learned. A dog can be rated high in intelligence if it is unusually capable of profiting by experience. A highly intelligent dog may be successful only when working with a handler who pleases it. With another handler, it may be unwilling and give the appearance of being stupid.

Willingness.

a. This term is an arbitrary one used to refer to the dog's reaction to the commands given by the handler. It applies to the way the dog responds to a command and to its apparent cheerfulness and acceptance in learning new duties. The dog may make the correct response to a command, or it may make some other response. In either case, if it makes an enthusiastic attempt, it is considered willing.

b. A dog is ranked high in willingness if it continuously responds to a given command in an effort to fulfill it, even though reward or correction is not immediate. Whether the dog possesses the required intelligence and physical strength, or whether it succeeds or fails, is not considered in determining willingness.

c. If the handler must constantly coax his dog along or admonish it before the dog works satisfactorily, it is considered an unwilling worker. A great number of dogs are perfectly capable of executing the required movements but are strongly inclined not to do so. An unwilling dog may appear to make a distinction between work and play, and may take great pleasure in retrieving, search for objects, and in taking jumps. The same dog may at times go to its handler spontaneously and apparently suggest a romp which may include any of the mentioned acts. When this situation is reversed and the handler initiates the activity, the dog, if unwilling, may seem to have forgotten all it ever knew.

d. A dog's willingness can be advanced or retarded by its handler. Improper handling may make a dog less willing at one time than at another time. For example, if the handler lacks patience, the dog may work willingly during the first few minutes of a training period, but unwillingly during the remainder of the period.

e. Unwillingness can be confused with a lack of intelligence or with lack of sensitivity. If the correct approach is not used, a dog that is insensitive to either sound or touch may appear to behave unwillingly to the commands and motivation given by the handler.