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Final Report *December 1984*

TARGET SEARCH TECHNIQUES (U)

By: HAROLD E. PUTHOFF EDWIN C. MAY

Prepared for:

DEPARTMENT OF THE ARMY
USAINSCOM
FORT GEORGE G. MEADE, MARYLAND 20755

Attention: LT. COL. BRIAN BUZBY

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Final Report
Covering the Period 15 November 1983 to 15 December 1984

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www.remoteviewed.com

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ESU 83-144

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TABLES

I OBJECTIVE (U)

(S/NF/CL-3) The objective of this effort at SRI International is to investigate a particular aspect of psychoenergetic phenomena called Target Search. This search technique is designed to determine the location of objects, individuals, and facilities where the potential target area can range from room- to global-sized dimensions.

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II INTRODUCTION (U)

A. (U) General

(S/NF/CL-3) A continuing requirement in military operations is determining the location of tactical and strategic military targets of interest, whose positions are not known or are known only approximately. Examples range from the location of (1) a "bug" in a secure facility, (2) a command post in a tactical situation or (3) a submarine in a strategic problem.

(S/NF/CL-3) A potential match to the above requirement is a claimed ability in the broad field of psychoenergetic functioning; namely, the ability to search for and locate water, oil, minerals, objects, individuals, sites of archaeological significance, and so forth. This ability can be contrasted to the related psychoenergetic ability "remote viewing," in the following manner. In remote viewing, the RVer is given location information (coordinates, "beacon" agent, picture), and (RV) asked to provide data on target content (e.g., BW R&D facility); in "search," the RVer is given information on target content, then asked to provide location data (e.g., position on a map). The two functions are thus complimentary to each other.

(U) The ability to locate targets is most often referred to as "dowsing" in the Western literature, and "biophysical effect (BPE)" in the Soviet/East Bloc literature. In this report, we shall refer to such techniques simply as "search." Although much of the literature is anecdotal,* attempts to quantify the ability and to determine its mechanisms have been pursued.†

*(U) For the most comprehensive and authoritative survey of the claims for dowsing, see Christopher Bird, *The Divining Hand*, E. P. Dutton, New York, NY (1979).

†(U) See, for example, papers published by Z. V. Harvalik, beginning 1970, in *The American Dowser*, the journal of the American Society of Dowsers, (Harvalik is the ex-director of the basic research group of the U.S. Army Engineering Laboratories, Fort Belvoir, VA.)

(S/NF/CL-3) The goal of the present effort is to research the literature, then perform laboratory experimentation to determine whether, and to what degree, such functioning is a viable candidate for application to intelligence-collection tasks. This includes determining the best methods and efficiencies of various search techniques, and the appropriate statistical analyses for evaluating results.

B. (U) Search Categories

(S/NF/CL-3) Search tasks fall into two broad categories of effort--continuum and discrete. In the "continuum" search category, a target of interest is typically to be located on a continuum area map, such as a topographical map or navigational chart (e.g., for a tank or submarine, respectively). For this category, the target/response distances and circular error probabilities (CEPs) constitute the statistics of interest in evaluation.

(S/NF/CL-3) In the "discrete" search category, a target of interest is associated with a discrete number of possibilities (for example, the location of a missile in one of K silos, or the location of an agent in one of K cities). For this category, the appropriate statistic of interest in the evaluation of a series of location attempts is a comparison against the simple binomial statistic of the probability of obtaining an observed R hits in N trials, by chance.

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III METHOD OF APPROACH (U)

A. (U) Continuum Search--Statistical Approach

(U) The first-order requirement in carrying out a continuum-search effort is to determine an appropriate method of evaluation. The approach chosen here is a modification of a procedure developed by Dean Radin at Bell Laboratories for evaluating geometric-distance scores in a perceptual task.* In this approach, one begins by assuming that the target area of interest is in the form of a square (a useful, but not necessary, requirement). A grid system is then laid down over the square in the form of an $n \times n$ matrix (20×20, say), to yield n^2 separate grid elements (400 for a 20×20 grid, for example). Using this grid as an approximation to a continuum, one can then calculate exactly the *a priori* chance distribution that any given search response would lie at any given distance from a particular target location. From this, an evaluation can be made on the quality of response (see Figure 1).

(U) In the 20×20 case, for a target square not on the edge, there is one chance in 400 of the searcher landing directly on the target square by chance, four chances in 400 of being one unit away (above, below, and to the sides), four chances of being $\sqrt{2}$ units away, and so forth. Counting out from any particular target square, the inhibition of responses beyond the boundary of the overall square (at certain distances in certain directions) is easily taken into account in the counting process. Thus, an exact calculation can be made on the basis of straightforward counting (taking into account edge effects) for the probabilities of all possible target/response pair distances. One result of these calculations for the 20×20 case (taken as standard) is Table 1, in which the mean distance from each given target square to all possible response squares in the grid is displayed. As a reference, the grand mean chance expectation (MCE) target response pair distance in the 20×20 grid is 10.41 units.

---

*(U) Radin, D., "Evaluating Geometric Distance Scores in a Perceptual Task," *Research in Parapsychology 1981*, pp. 163–164, Scarecrow Press, Inc., Metuchen, NJ (1982).

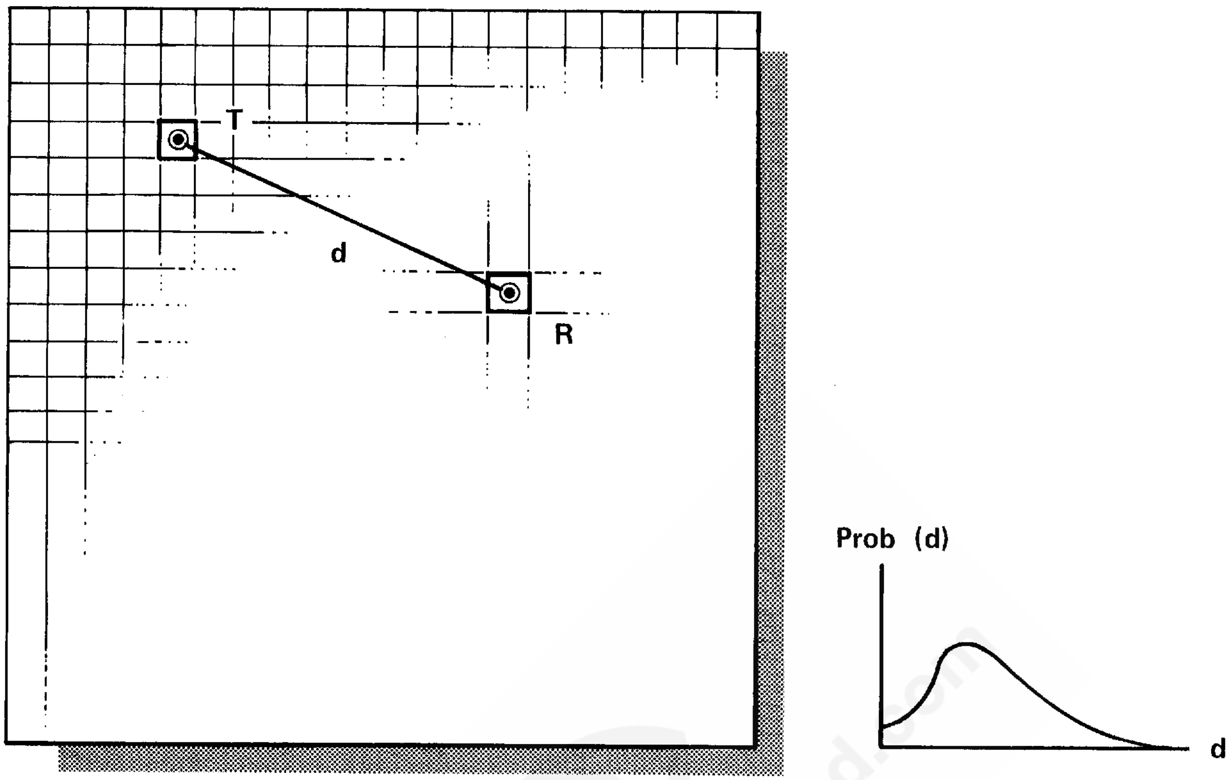

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FIGURE 1 (U) SEARCH MATRIX

(U)

Thus, if the search area of interest is 20 km × 20 km, the MCE distance for random attempts to locate a random target is 10.41 km.

B. (U) Discrete Search--Statistical Approach

(U) In the discrete search case (one choice from among K possibilities), the appropriate evaluation statistic is the cumulative binomial distribution. The parameters are as follows.

(U) We define a trial as a single attempt to pinpoint a target as being at one of K possible target locations. Let p = 1/K be the probability of a chance hit in the location attempt in a single trial, and q = 1 − p be the probability of a chance failure in a single trial.

Table 1

(U) TABLE OF MEAN DISTANCES

(Beginning Row 1, left to right, square (1,1), (1,2)...,
through upper left-hand quadrant of 20 x 20 matrix)

14.65585,	14.04415,	13.48960,	12.99671,	12.56888,
12.20876,	11.91840,	11.69934,	11.55270,	11.47920,
14.04415,	13.40802,	12.83167,	12.31976,	11.87571,
11.50216,	11.20110,	10.97406,	10.82211,	10.74596,
13.48960,	12.83167,	12.23547,	11.70606,	11.24699,
10.86094,	10.54992,	10.31541,	10.15851,	10.07989,
12.99671,	12.31976,	11.70606,	11.16104,	10.68848,
10.29114,	9.97108,	9.72981,	9.56839,	9.48751,
12.56888,	11.87571,	11.24699,	10.68848,	10.20417,
9.79695,	9.46895,	9.22171,	9.05630,	8.97343,
12.20876,	11.50216,	10.86094,	10.29114,	9.79695,
9.38139,	9.04665,	8.79433,	8.62554,	8.54097,
11.91840,	11.20110,	10.54992,	9.97108,	9.46895,
9.04665,	8.70647,	8.45003,	8.27849,	8.19254,
11.69934,	10.97406,	10.31541,	9.72981,	9.22171,
8.79433,	8.45003,	8.19049,	8.01685,	7.92986,
11.55270,	10.82211,	10.15851,	9.56839,	9.05630,
8.62554,	8.27849,	8.01685,	7.84182,	7.75412,
11.47920,	10.74596,	10.07989,	9.48751,	8.97343,
8.54097,	8.19254,	7.92986,	7.75412,	7.66607

Grand Mean = 10.41513

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(U)

In a series of location attempts, the important statistic is the probability of obtaining at least R hits in N trials, by chance, because this distribution establishes the basis against which the efficiency of the search method must be compared. This statistic is given exactly by the cumulative binomial (Bernoulli) distribution.

(U)

$$\text{Probability of at least R hits in N trials} = \sum_{i=R}^{N} \frac{N!}{i!\,(N-i)!}\, p^{i}\, q^{N-i} \quad . \tag{1}$$

Although probabilities are listed for several representative values in published tables,* it is perhaps most convenient to calculate them directly with the aid of a standard programmable calculator. A program for the Hewlett–Packard HP 41–C series calculator is provided for convenience as Table 2.

(U) To complete discussion of the binomial distribution, we note that the mean number of hits expected by chance in N trials is $\mu = Np$, while the standard deviation (measure of expected spread about the mean) is given by $\sigma = \sqrt{Npq}$

(U) Throughout the statistical evaluations, whether for continuum or discrete search, we shall adhere to the standard convention that a result obtained in testing can be interpreted as evidence for psychoenergetic access if the probability of that result occurring by chance is less than $p = 0.05$.

*(U) *Tables of Cumulative Binomial Probability Distribution*, Harvard University Press, Cambridge, MA (1955).

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Table 2

(U) HP 41-C PROGRAM: CUMULATIVE BINOMIAL DISTRIBUTION

```
01♦LBL "CUM BIN"
02 SCI 3
03 0
04 STO 01
05 "A PRIORI P?"
06 PROMPT
07 STO 02
08 LN
09 STO 03
10 RCL 02
11 CHS
12 1
13 +
14 STO 04
15 LN
16 STO 05
17 "NR HITS?"
18 PROMPT
19 STO 06
20 "NR TRIALS?"
21 PROMPT
22 STO 07
23♦LBL 08
24 RCL 07
25 RCL 06
26 -
27 STO 09
28 RCL 05
29 *
30 RCL 03
31 RCL 06
32 *
33 +
34 STO 10
35 1
36 STO 11
37 RCL 07
38 STO 12
39 RCL 06
40 RCL 09
41 X>Y?
42 GTO 15
43 X<>Y
44♦LBL 15
45 RDN
46 X=0?
47 GTO 17
48 STO 14
49♦LBL 16
50 RCL 12
51 RCL 14
52 /
53 RCL 11
54 *
55 STO 11
56 1
57 ST- 12
58 1
59 ST- 14
60 RCL 14
61 X=0?
62 GTO 17
63 GTO 16
64♦LBL 17
65 RCL 11
66 LN
67 RCL 10
68 +
69 E↑X
70 ST+ 01
71 RCL 01
72 TONE 0
73 PSE
74 1
75 ST+ 06
76 RCL 06
77 1
78 -
79 RCL 07
80 X>Y?
81 GTO 08
82 RCL 01
83 "P, R OR MORE="
84 ARCL X
85 AVIEW
86 BEEP
87 END
```

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IV EXPERIMENTAL EFFORT (U)

A. (U) General

(U) In pursuing the search task, SRI engaged several remote viewers (RVers) ranging from (1) volunteer subjects, (2) experienced SRI RVers, through (3) well-known professional "dowsers" (who were contacted through the American Society of Dowsers). In somewhat extensive work with the latter, every effort was made to determine whether whatever skills could be demonstrated might be of a transferable nature.

B. (S/NF/CL-3) Simulation of "Bug" Search (Continuum)

(S/NF/CL/3) Described here is a test of whether a search procedure involving attempts to locate small objects in a room (e.g., a "bug") would be successful. The target location was a large conference room in which a >1400 sq. ft. area (37.5 × 37.5 ft) was designated as the potential target area. For each trial, a small hand-size object was chosen (e.g., a calculator) then placed somewhere in the conference room--the location was determined by entry into a random number generator for x-y coordinates on a 20 × 20 unit grid.

(U) A total of 50 trials, 25 in each of two conditions (labeled I and II), was carried out with an experienced SRI RVer (#688) as search percipient. The RVer was in the RV chamber on the third floor of the Radio Physics Laboratory (RPL); the target area was a locked and guarded, nonoccupied conference room on the ground floor of the RPL.

1. (U) Condition I

(U) In Condition I, for each trial, an experimenter (E1) places an object at a location in the target room (determined by random number generator), then remains outside the target room as a guard. A few minutes later, at a previously-agreed-upon time, Experimenter E2, who is kept blind as to the object's location, has the RVer indicate his assessment of the object's location. The RVer places a mark on a piece of paper containing a single blank square to represent the target room. At the end of the trial, the RVer turns

(U)

his response over to E2, the two of them proceed to the target room to meet E1, and they all enter the room to obtain feedback. Following feedback, the response coordinates, obtained by use of a 20 $\times$ 20 grid square overlay on the response sheet, are determined, and (along with the target coordinates) are entered into a computer to compare the probability of the observed result against chance.

(U) In the 37.5–ft–square target area, the mean chance expectation (MCE) target/response pair distance is 19.5 ft. In the 25 trials taken under Condition I, the target/response pair distances ranged from a maximum of 15.6 ft to a minimum of 2.0 ft, with a mean of 13.5 ft. This result (a 31 percent reduction from MCE) is statistically significant at $p = 1.7 \times 10^{-3}$. As a second measure of performance, the target/response pair distances were ordered such that there was a trend from larger to smaller distances as the series progressed, providing some evidence of improvement in task performance over time, but the trend was not statistically significant.

2. (U) Condition II

(U) The Condition I and Condition II series were carried out in an identical fashion, except that in Condition II, only one experimenter (E1) was involved. Thus, E1 "hid" the object for each trial. In the 25–trial sequence, the target/response pair distances ranged from a maximum of 37.5 ft to a minimum of 3.75 ft, with a mean of 18.8 ft. This result (a 4 percent reduction MCE) is statistically nonsignificant. In the second measure of performance, however, the target/response pair distances were again ordered from larger to smaller as the series progressed, but, in this case, the trend was statistically significant ($p < 0.05$). Thus, evidence of improvement in task performance over time was established.

(U) With regard to the difference in RVer performance between Conditions I and II (which, a one–way analysis of variance shows to be significant*), one can simply note the difference in the two conditions. Technically speaking, the RVer's task was identical in the two cases––namely, to determine the location of a randomly–placed object in a target room. The psychology differed somewhat, however, in that during the less successful series (Condition II), one experimenter hiding an object could be said to have more of a "game"

---

*(U) $df1 = 1$, $df2 = 48$, $F = 4.94$; $p= 0.031$.

aspect to it than in Condition I, where the task is structured more along application lines of an experimenter and RVer searching for an object placed by a third party. Another difference is that the second series followed the first; the trend may simply reflect the "decline" effect that is typical in the psychoenergetics field when experimentation becomes a repetitive routine. Further work along these lines would be required to clarify this particular facet. Nonetheless, with both sets of data combined, the overall result, a mean target/response pair distance of 16.2 ft (17 percent reduction of MCE), is statistically significant at $p = 0.01$. Thus, the experimental series as a whole indicates that the application of psychoenergetic search techniques, although not yet developed to high accuracy, can augment other techniques in locating small target objects in a remote, otherwise inaccessible, space.

C. (S/NF/CL-3) Simulation of "Agent" Search, Facility Level (Continuum)

(U) The RVer who participated in the above experiment was asked to take part in a second experiment of a similar nature. In the second case, the target was to be a person, located somewhere on the grounds of the SRI 70-acre complex. The RVer entered the RV chamber on the third floor of the RPL, then an experimenter was sent to a random location, determined by entry into a random number generator for x-y coordinates on a 20 × 20 unit grid.

(U) Forty trials were carried out--20 in each of two conditions; the second condition differed from the first only in that the RVer had in his possession a sample of hair from the individual to be targeted (to test the so-called "witness" concept, part of the lore in dowsing studies).

(U) The outcome of this experiment was that neither series yielded results differing from chance expectation, nor was there any significant difference between the two conditions. Although the RVer expressed subjective differences in attempting to locate a person (as opposed to an object), no conclusions as to the difference between the two Experiments B and C* could be drawn.

*(U) Defined in Subsections B and C of this chapter and hereafter referred to as Experiments B and C.

D. (S/NF/CL-3) Simulation of "Agent"/Facility Search (Continuum)

(S/NF/CL-3) A series of trials was undertaken with a special RVer, recommended by the American Society of Dowsers, who responded to an invitation to participate in the SRI search program (#198). An initial exploratory series of eight trials was carried out as in Experiment B, Condition I, (simulation of "bug" search, with a calculator as target object). The results were not beyond chance expectation. Debriefing of the RVer revealed a preference for tasks that involved people, as in locating people, or places inhabited by people. Therefore, a second exploratory series of fifteen trials was performed, the first ten of which repeated the same experiment, but with an individual replacing the object. For the remaining five trials, the target area in which the individual was located was expanded to the SRI complex as in Experiment C above. The overall result in this series also was not beyond chance expectation, but the target/response pair distances were ordered such that there was a trend from larger to smaller distances as the series progressed, which began to approach statistical significance ($p = 0.07$). Therefore, a more extensive series was planned in which "peopled" locations were to be the targets.

(U) For this series, the target area was a > 20 sq. km area (4.8 km × 4.8 km). The viewer was provided a satellite photograph of the area with a 20 × 20 unit grid overlay. In order to investigate potential differences in targeting strategies, a targeting protocol was prepared for the series in which, on an intermixed basis, the RVer was targeted on being (1) given a photograph of the site, e.g., of a house, (2) told that an experimenter known to the RVer was at a site, (3) told the name of the site (e.g., Stacey's Bookstore). Twenty-one trials were carried out under this protocol: six under targeting method (1), six under targeting method (2), and nine under targeting method (3).

(U) In the 4.8-km-square area, the mean chance expectation distance is 2.5 km. In the 21-trial sequence, the target/response pair distances ranged from a maximum of 3.36 km to a minimum of 0.34 km, with a mean of 1.55 km. This result (a 38 percent reduction from MCE) is statistically significant at $p = 1.1 \times 10^{-3}$.

(U) With regard to the difference in RVer performance between targeting conditions, the mean target/response pair distance was least for the photo-targeting condition (1), median for the person-targeting condition (2), and maximum for the name-targeting condition (3)—1.15 km, 1.58 km, and 1.80 km respectively. One-way analysis of variance

(U)

shows, however, that the differences between the conditions were not statistically significant.* Furthermore, no statistically-significant ordering of the target/response distances was observed as the series progressed, indicating a level performance throughout the series.

E. (U) Binary Search (Discrete/Continuum)

(U) A "zeroing-in" approach that suggests itself is a sequential method whereby the RVer makes a series of binary decisions to close in, step-by-step, on the target. If one begins with a square map, for example, the sequence of questions would be of the form "left or right half," followed by "upper or lower half" of the remaining half, followed again by "left or right half" of the remaining square, and so forth, as indicated in Figure 2. After n binary decisions, the designated target area would be narrowed down to $1/2^{nth}$ of the original area (1/2, 1/4, 1/16, 1/32, ...). Assuming a flawless sequence of binary decisions, one could pinpoint a target location relatively quickly by this means.

(U) The statistics of binary ($p = 1/2$) sorting by psychoenergetic means are relatively well known, and on the order of a few percent above chance--this is statistically significant, but is of little use in applications. One is led naturally to consideration of the use of redundancy in one form or another (e.g., repetitive "guessing"), in order to amplify the small statistical advantage available into an overall higher-accuracy result for the basic binary process. As part of the binary-approach study, we investigated implementation of the redundancy concept, reduced to practice in the form of a hand-held calculator programmed for statistical averaging of (psi) inputs by an RVer.

(U) The targets for the series described here are the outcomes (black/red† in roulette wheel spins) that are being generated in a double-blind fashion by an experimenter. The task is thus one of determining whether a roulette ball is located in a red or a black bin. As the RVer attempts to identify the ball's location, several responses are entered into a calculator for statistical averaging as described below.

---

*(U) $df1 = 2$, $df2 = 18$, $F = 1.43$; $p < 0.26$.

†(U) Green 0 and 00 are, for the purposes of this study, taken to correspond to red and black, respectively.

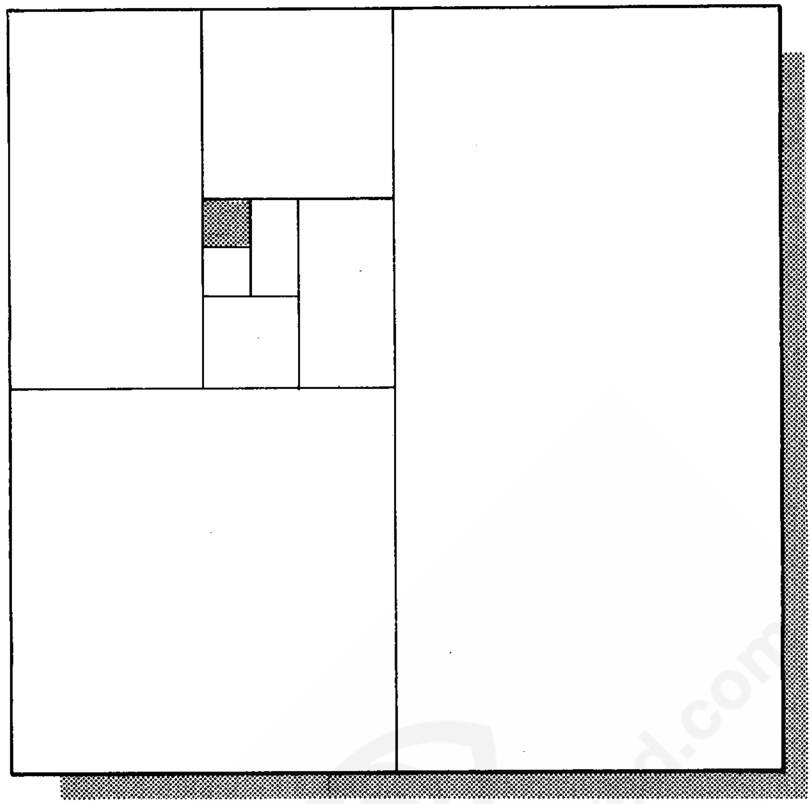

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FIGURE 2 (U) BINARY APPROACH TO TARGET LOCATION

(U) The underlying analytical basis for the experimentation consists of a simple majority-vote-of-five procedure, which we refer to as a 5-bit majority-vote code. Each trial consists of five individual subtrials, with a majority vote (3 or more selections out of 5) constituting the overall trial selection. (In practice, the five-subtrial-sequence can be shortened, because once three selections of a particular alternative have been accumulated, no more are required.) A critical feature of the procedure is that the subtrials are arranged to be independent by means of a calculator programming technique to be described shortly.

(U) In the terminology of coding theory, the majority-vote-of-five procedure constitutes an application of block coding theory in which a (5, 1) block code (block length 5, 1 information bit) is used to correct all single and double errors in the detection of a 5-unit block. It can be shown that, with regard to error-correcting coding, no better 2-letter

(U)

(binary) 5–place alphabet than the majority–vote code exists,* and the argument holds for all other odd–length (n, 1) block codes.

(U) With the probability of being correct in a single subtrial given by P, the probability of a correct majority vote in five independent subtrials is found by application of the binomial distribution to be

$$P(corr) = 10p^3(1 - p)^2 + 5p^4(1 - p) + p^5 \quad . \tag{2}$$

Assuming the RVer's selections to be in the correct direction, with an average magnitude of $P > 0.5$, the overall probability of error, $1 - P(corr)$, for the 5–bit majority–vote code is shown in Figure 3. As can be seen, the error rate decreases dramatically as higher P values are reached.

(U) As indicated earlier, a critical element of the procedure is to arrange for the five subtrials to constitute independent attempts at target specification. The procedure chosen is one that is especially amenable to implementation by the use of a programmable calculator—here one of the HP–41C series. The calculator program used is provided in Table 3.

(U) Taking 0 and 1 to represent the two possible outcomes of interest, a ball located in the red bin or black bin, respectively, were one to simply enter a series of 0's and 1's into a calculator memory to represent selections, the individual entries would not likely constitute independent events. To overcome this shortcoming, the calculator is programmed such that the 0 and 1 buttons used to enter selections do not, in fact, provide direct access to the 0 and 1 memory registers, respectively. Instead, an internal random number generator relabels the 0 and 1 buttons, subtrial to subtrial, on a random basis. The RVer's task, therefore, reduces to one of simply pressing the "right" button, subtrial to subtrial, to accumulate entries in the "right" memory location. As a result, the five subtrials are effectively independent by virtue of the random renumbering of the buttons. Although such a procedure may seem somewhat abstract as a means to implement the binary search procedure, the

*(U) Slepian, D., "A Class of Binary Signaling Alphabets," *The Bell System Technical Journal*, Vol. 35, pp. 203–234 (January 1956).

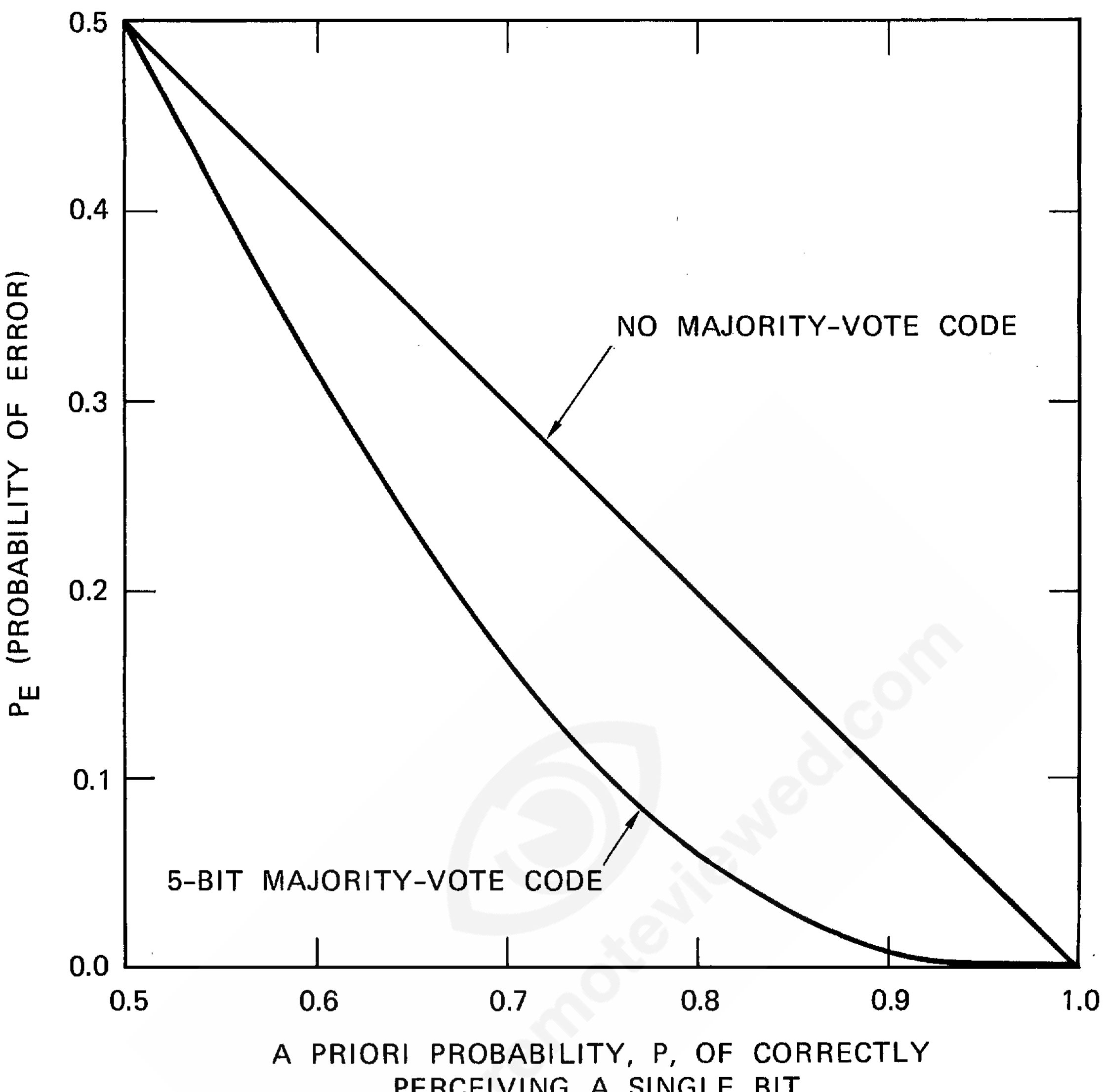

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FIGURE 3 (U) PROBABILITY OF ERROR, P_E, WITH AND WITHOUT USE OF A SIMPLE 5-BIT MAJORITY-VOTE CODE

(U)

potential for increasing accuracy on the basis of multiple choices per decision, statistically averaged, is considered well worth the effort.

(U) As a subtrial series is carried out, the calculator registers the inputs until three entries have been accumulated in either the 0 or 1 memory register (which takes as few as

Table 3

HP 41-C CALCULATOR PROGRAM FOR 5-BIT MAJORITY VOTE CODE

```
01♦LBL "BLOCK N"
02 "BLK L?"
03 PROMPT
04 STO 06
05 2
06 STO 29
07 TIME
08 LN
09 ABS
10 STO 30
11 0
12 STO 00
13 STO 01
14 STO 02
15 STO 03
16 STO 04
17 1
18 STO 05
19♦LBL "BLK BIT"
20 XEQ "RNG SUB"
21 "READY"
22 TONE 7
23 TONE 6
24 PROMPT
25 +
26 RCL 29
27 MOD
28 STO 31
29 1
30 ST+ IND 31
31 ST+ 02
32 RCL 06
33 1
34 +
35 2
36 /
37 RCL IND 31
38 X=Y?
39 GTO "BLKDONE"
40 GTO "BLK BIT"
41♦LBL "BLKDONE"
42 FIX 0
43 BEEP
44 "CHOICE="
45 ARCL 31
46 AVIEW
47 STOP
48 "ANSWER?"
49 PROMPT
50 STO 07
51 RCL 31
52 RCL 07
53 X=Y?
54 GTO "BLK HIT"
55 RCL 31
56 1
57 +
58 RCL 29
59 MOD
60 STO 32
61 RCL IND 32
62 GTO "END"
63♦LBL "BLK HIT"
64 1
65 ST+ 04
66 RCL IND 31
67♦LBL "END"
68 ST+ 03
69 TONE 6
70 "TRIAL NR="
71 ARCL 05
72 AVIEW
73 STOP
74 FIX 1
75 RCL 03
76 RCL 02
77 /
78 100
79 *
80 TONE 6
81 "% BIT HITS="
82 ARCL X
83 AVIEW
84 STOP
85 RCL 04
86 RCL 05
87 /
88 100
89 *
90 TONE 6
91 "% BLK HITS="
92 ARCL X
93 AVIEW
94 STOP
95 0
96 STO 00
97 STO 01
98 1
99 ST+ 05
100 GTO "BLK BIT"
101 .END.
01♦LBL "RNG SUB"
02 9821
03 RCL 30
04 *
05 .211327
06 +
07 FRC
08 STO 30
09 RCL 29
10 *
11 INT
12 END
```

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three, and up to five entries), at which point the calculator program announces the overall trial result.

(U) To date, two RVers have completed a 100-trial series under the protocols described; their results are summarized in Table 4 and in Figures 4 and 5. In the figures, cumulative percentage hits are plotted for both the subtrial data and the majority-vote trial data. As is evident by inspection, the 5-bit majority-vote procedure amplifies the statistical advantage of the subtrial entries, as could be expected in the case of extra-chance RV performance. In particular, whereas only one of the two RVer's subtrial data displayed in Table 4 were significant [evaluated by Eq. (1)], both RVer's 5-bit majority-vote data independently reached significance.

Table 4

(U) BINARY DATA SUMMARY

Percipient	Summary Statistics (subtrials)	Summary Statistics (5-bit majority-vote trials)
#642	R = 52.6% (219/416) p = 0.14	R = 60.0% (60/100) p = 0.028
#730	R = 55.0% (220/400) p = 0.023	R = 60.0% (60/100) p = 0.028
Combined Data	R = 53.8% (439/816) p = 0.015	R = 60.0% (120/200) $p = 2.8 \times 10^{-3}$

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(U) The use of a calculator as a convenient on-line psi-amplification tool appears to hold promise as a first step in the development of a binary search procedure. The study shows that the accuracy of the individual bit choices can be amplified by the use of the statistical averaging procedure described. The level of accuracy reached (60 percent) although statistically significant, needs to be strengthened by further research before binary search meets minimal requirements for application efforts.

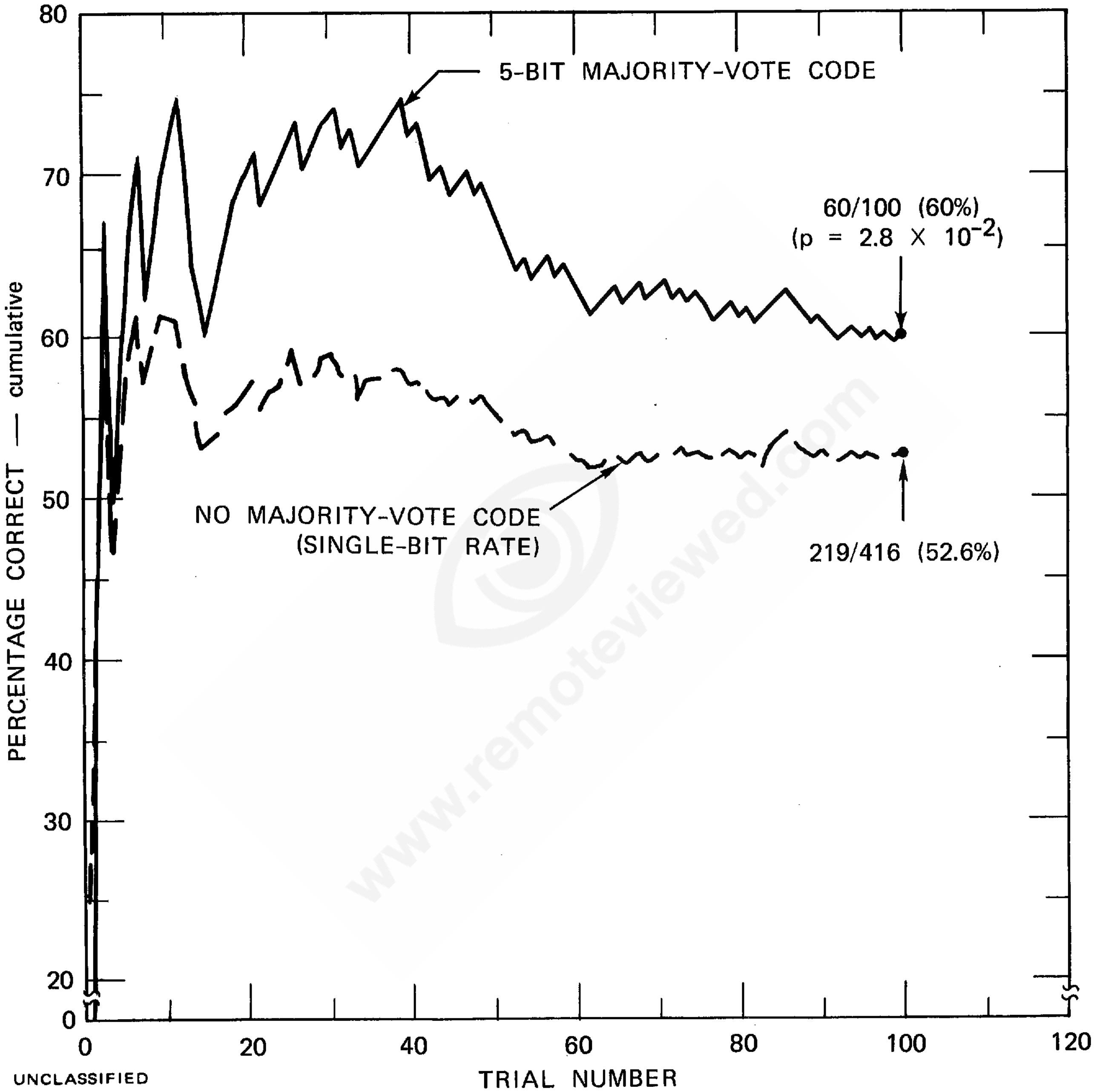

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FIGURE 4 (U) RANDOM BINARY TASK PERFORMANCE, PERCIPIENT #642

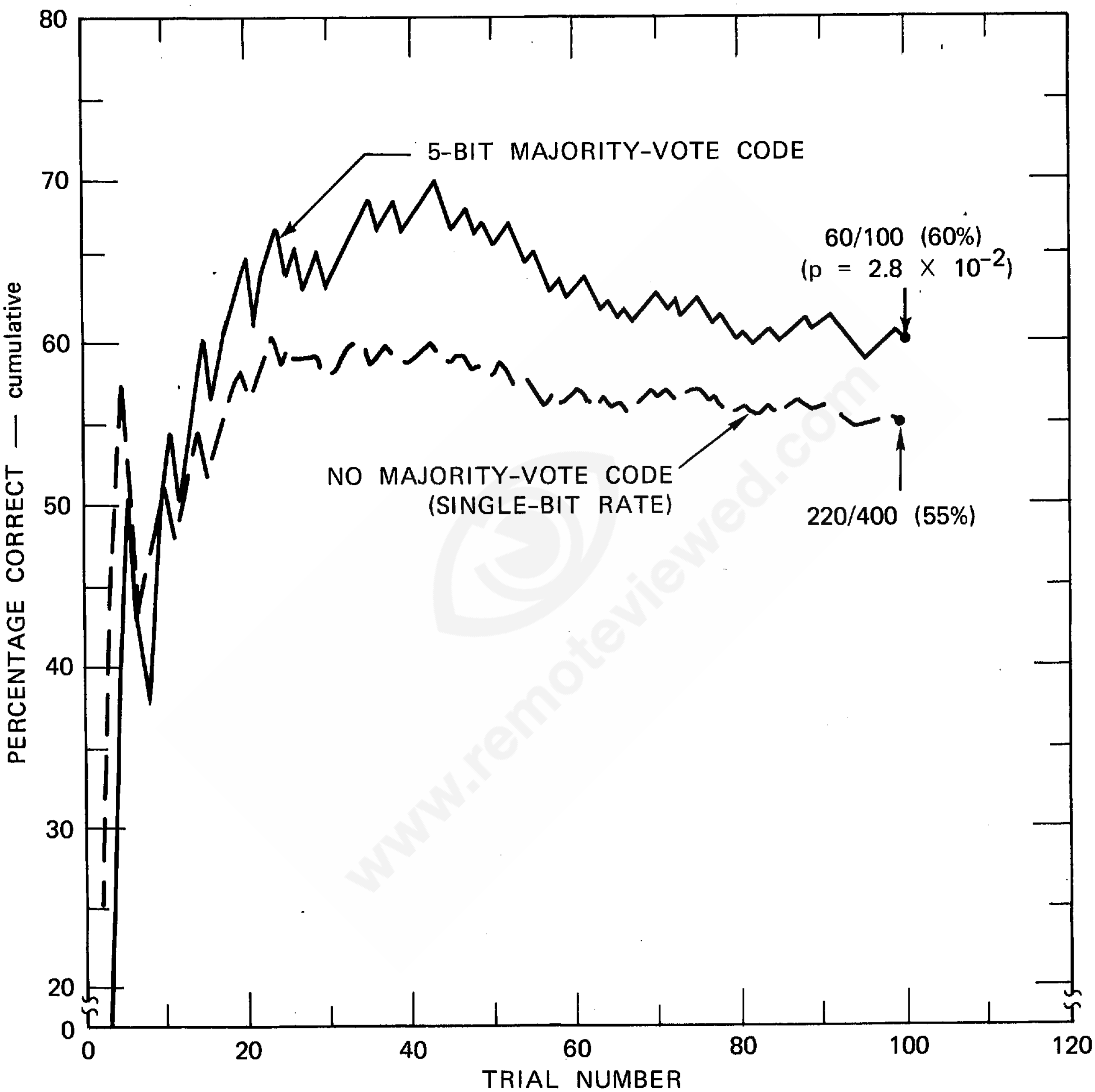

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FIGURE 5 (U) RANDOM BINARY TASK PERFORMANCE, PERCIPIENT #730

F. (U) Computer Assisted Search (CAS)

(S/NF/CL-3) To determine the applicability of computers as aids in the general search problem, we have developed a graduated series of studies—beginning at a basic level of investigation and evolving toward real-time DoD applications. As a first step in determining the degree to which a computer can be used as an aid in search problems, an experiment was conducted that demonstrated that an abstract computer-generated target could be located by psychoenergetic means. The next stage involved testing whether an "association" between an abstract computer "target" and an actual target could be established.

1. (U) Basic Investigation (Simulation)

(U) We have conducted an experiment to determine if an abstract computer-generated target can be located by psychoenergetic means. To accomplish this, we designed an experiment that would also provide information with regard to two possible mechanisms:

- To search in space for a target that remains fixed for the duration of a trial.
- To search for a target that is rapidly moving in space.

(U) The first case is the more familiar "dowsing" situation; a target, whose location is unknown, must be found by psychoenergetic means. The second case was established on the basis of earllier research at SRI. Namely, that it is possible for an individual to initiate an action *at the proper time* to optimize the result of a psychoenergetic experiment.

(U) During the CAS experiment, seven individuals were asked to contribute 50 trials each. To test the "dowsing" hypothesis, the target location was fixed throughout a trial. To test the timing hypothesis, the target location was changed once each millisecond. Dynamic versus static target trials were determined by a balanced random protocol that was the same for each of the participants. Furthermore, they were unaware that there were two test conditions. A bounded area representing the perimeter of a 20 × 20 cell matrix was shown to the participant, who could register his/her response by moving a graphics pointing device (mouse), and could press a button to indicate the choice. Each participant was told that the target could be any place within the display boundary, and when the moment "seemed right," could register his/her choice by pressing the button on the mouse. Each

(U)

participant was constrained to provide a few trials (< 5) at each sitting. The analysis that was used is described in Section III.A.

(U) From a purely mechanistic point of view, we might expect that locating a dynamically-moving target would be "easier" than a static one. Because the target is moving once a millisecond, the target is, on the average, actually "under" the mouse button twice each second. Thus, two times a second, the participant has the opportunity to locate the target correctly. He/she must, however, press the mouse button at the proper time (finding a dynamically-moving target translates to finding a moment in time to initiate a response). In the static case, it is possible (worst case) that the location will never be under the mouse button, because the RVer, in moving the button display around the screen, misses the actual location. Thus, we would expect a bias in favor of finding the dynamic target simply because the number of opportunities of registering the correct response is greater.

(U) The results of the basic investigation are shown in Table 5. Five of the seven participants produced significant evidence of psychoenergetic functioning ($p < 0.0004$). Of these five, three produced results favoring the timing hypothesis, and two favored the "dowsing" hypothesis. Two participants produced significant differences between temporal and spatial "dowsing;" one (#531) favoring temporal, the other (#807) favoring spatial. Participant 531 showed a 27 percent reduction from the mean chance expectation (MCE) distance of 10.4 units, while Participant 807 showed a 16.1 percent reduction. Overall, there is strong evidence that individuals can locate abstract computer generated targets, yet there is no evidence that there is a preference for the timing technique.

2. (U) Location of Real-World Targets (Known)

(S/NF/CL-3) The first step in determining if the CAS technique is capable of locating unknown DoD targets of interest, is to demonstrate that the technique can be applied to real-world targets whose locations are known. This step has been taken under client-controlled test conditions, as described in Section G.

Table 5

(U) RESULTS OF BASIC INVESTIGATION
(p-values)

RVer	Space	Time	Difference*
531	.560	.009†	.038†
240	.365	.042†	.164
859	.528	.042†	.100
452	.752	.911	.691
310	.184	.363	.652
807	.047†	.994*	.998*
164	.031†	.295	.826

*Tested against the hypothesis that time > space.
†Significant
‡Target avoidance.

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3. (U) CAS Against Real Targets (Application)

(S/NF/CL-3) As a final test, can CAS techniques be used to locate unknown targets that are of interest to the DoD? The use of both static and dynamic techniques will be considered.

(U) In the case of the latter, a useful technique is to divide the search space into N regions. A counter is incremented once each millisecond as before, but it begins at one and recycles after N + 1. The extra cell is used to cover the case of "none of the above". To illustrate how this technique might work, let us consider the case of a kidnap victim who is suspected of being held somewhere in the west Beruit area. This area is divided into 20 regions of interest. (The CAS counter then cycles through 21.) A large number of trials are collected for a given participant, and a large number of participants could be used. Statistics developed during the *known target* portion of the study would be used as an input to the evaluation program to determine the most likely location. Should this technique prove successful, it has wide application beyond the spatial location of targets of interest. Because the CAS algorithm only involves selecting the proper moment to register a response, the meaning of the numbers used in the cycle counter is completely arbitrary, and thus can correspond to the elements of any discrete search problem.

G. (S/NF/CL-3) Client-Controlled Long-Distance Test of "Agent"/Building Search, Facility Level (Continuum)

(S/NF/CL-3) As a measure of progress made during the contract effort, a test was proposed in which the Search team put together by SRI would attempt to locate targets chosen by, and under the control of, the client (Army INSCOM). For this purpose two experimental series were designed and carried out.

1. (U) Long-Distance "Agent" Search

(S/NF/CL-3) For the first test series, Army INSCOM personnel chose a series of ten locations on the Ft. Meade, Maryland, base. Each of the ten locations were to be visited, in turn, for one hour, at predetermined times, by an INSCOM "agent." Members of the Search team where given a photograph of the "agent" to be located, a listing of the target times (1100 and 1600, EST, on 28–30 November, and on 3–4 Dec.), and a map of the Ft. Meade base marked with a 1.5 km × 1.5 km square indicating the overall target area of iterest.

(U) Four Search RVers were chosen for this task (Nos. 164, 688, 198, and 232), three of whom demonstrated success in other search tasks covered in this report, the fourth (#232) being reported as having been successful in experiments conducted in a training class taught by one of the others (#198). During the time-frame of the experiment, two of the RVers were located in California (Nos.164 and 688), while the remaining two were in Florida. Thus, the experiment was carried out over baselines of several thousand km.

(S/NF/CL-3) The experiment was carried out with the SRI researchers blind as to the target locations (that is, the experiment was double blind.) At the end of the targeting period, the search-determined locations were transmitted to INSCOM, after which a list of the actual target locations used were made available to the SRI team.

(U) In the 2.25 km square area, the mean chance expectation (MCE) distance is 780 m. Of the four Search RVers, all generated lesser mean distances (see Table 6), and the results of three of the RVers are each independently statistically significant. In the forty trials generated (4 RVers × 10 trials each), 20 percent (8) yielded target-response distances within 3 squares (225 m) on the 400-square matrix used for analysis; this includes a direct hit which is expected only once in 400 trials by chance. The overall combined probability for this 40-trial series can be determined from the raw data

$$Z = \frac{\Sigma \ z_i}{\sqrt{N}} \ , \qquad p \le 2.5 \times 10^{-4} \ .$$

Thus, this test under client-controlled double-blind conditions yields convincing evidence that psychoenergetic search processes can to a statistically significant degree be used as a viable search tool.

Table 6

(U) LONG-DISTANCE "AGENT" SEARCH: CLIENT-DETERMINED TARGET SITES

(MCE Distance = 780 m)

RVer	Mean Target Response Distance	Area Reduction	p
164	391 m	75%	2.62×10^{-3}
688	616 m	38%	0.39*
198	447 m	67%	1.45×10^{-2}
232	492 m	60%	4.65×10^{-2}

*Nonsignificant.

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(U) An additional facet that surfaced in the above application was the fact that, due to scheduling conflicts, some percentage of the search attempts were carried out at some

(U)

time following the target period, ranging from as little as a few minutes to as much as two days. In these cases, the RVer nonetheless concentrated on the scheduled past time period, rather than on the (present) time of the actual search attempt. Detailed examination of the data generated by the three significant RVers shows that although 40 percent each of their data was produced on this retrospective basis, there was no statistically significant difference between the real-time and retrospective conditions (one-way analysis of variance, df1 = 1, df2 = 8, F = 0.54, 2.40, and 1.51, respectively, for RVers 164, 198 and 232; F = 5.32 required for significant differences at the $p = 0.05$ level).

2. (U) Long-Distance "Building" Search

(U) The dynamic CAS technique was used to attempt to locate a building at the sponsor's facility, that building being known only to the sponsor. A map of the sponsor's facility, unlabeled as to buildings, was divided into 20 numbered equal-area rectangles in a 4×5 matrix, (4 columns, 5 rows). Thus, starting in the upper left corner, the upper row contained rectangles 1 – 4; the second row, 5 – 8; third row 9 – 12; fourth row, 13 – 16; fifth (bottom) row, 17 – 20.

(U) An incremental counter was used to cycle through the numbers 1 – 20 at a rate of 1 millisecond each. A search RVer's task was to interrupt the counter (by pressing the "mouse" button) at the number corresponding to the map area that contains the building designated as "target" by the sponsor, given only the name of the building (Whitesell building). For each RVer, a histogram is constructed corresponding to the number of times he/she selects each of the numbers.

(U) The two individuals (531 and 859) who had done well in the abstract experiment in timing were asked to provide 50 trials each to start; in the event an individual's selections resulted in a tie or ties for a maximally-selected rectangle, trials were added in 5-trial blocks until a single choice was outstanding. In the case of 531, 55 trials were required to meet this criterion; for 859, 75 were required.

(U) In Figure 6 we display the histograms for each participant. For RVer 531, the expected number of choices for each rectangle is 55/20 = 2.75; the maximally-selected rectangle (#17) was chosen 6 times, the second choice (#14) was chosen 5 times. For RVer 859, the expected number of choices for each rectangle is 75/20 = 3.75; the maximally-selected (#6) was chosen 7 times, the second choice (nos. 4 and 18, a tie)

(U)

was chosen 6 times. Following RVer selections, the answer (rectangle #15) was provided to the experimenters, who, in turn, provided it to the search RVers as feedback.

(U) With regard fo evaluation of the results, as in the previous section one can use the 400–square matrix to calculate the probability of observed separations between target and response rectangle centers as compared with the MCE distance. For RVer 531, the first–choice selection yields a target/response rectangle separation distance somewhat greater than MCE (3.4%), while the second choice yields a better result, a 52.0% reduction from MCE. For RVer 859, the first–choice selection yields a 9.5% reduction from MCE, while the second (a tie) yields one result at 38.5% reduction from MCE, a second at 24.8% greater than MCE distance. Given the small–sample nature of this particular pilot test of the CAS technique, it is not possible to draw meaningful statistical conclusions. We are nonetheless encouraged by observation of relatively large reductions from MCE among the top two selections for each of the search RVers, and therefore consider this procedure a promising candidate for further development.

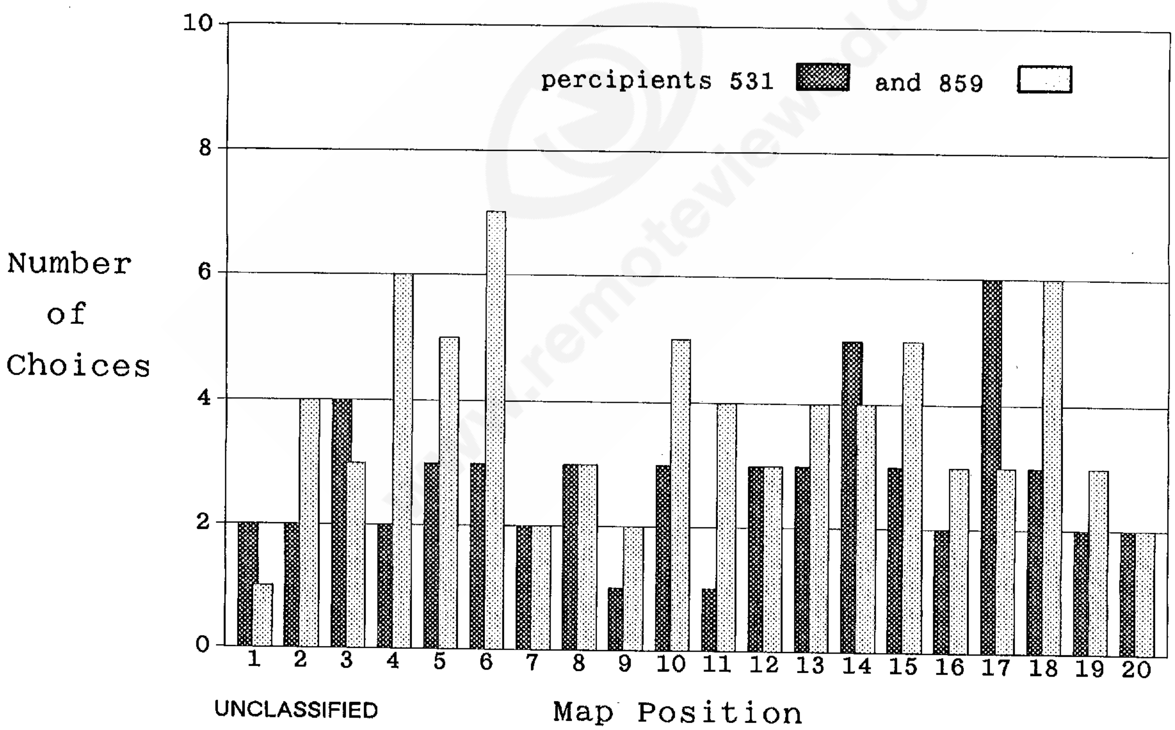

FIGURE 6 CHOICE HISTOGRAM

V SUMMARY (U)

A. (U) Overview

(S/NF/CL-3) The research effort described in this report addresses the continuing requirement in military operations to develop techniques to locate tactical and strategic targets of interest whose positions are not known, or are known only approximately. Specifically, we have investigated the possible use of psychoenergetic search techniques as an adjunct to other technological means. Experiments have been carried out, examining several promising methods that have emerged in the field over the past decade or so. Care has been taken to assess the various procedures under strict double-blind conditions, and have included successful application to the location of targets under client control over baselines of several thousand km.

B. (U) Focus of Investigation

(U) In this study the search techniques under consideration have been investigated in applications ranging from the locations of objects hidden in the same building as the search RVer, to the search for an individual or building over transcontinental baselines. The methods examined range from simple one-step map marking ("map dowsing"), to calculator- and computer-assisted search involving sophisticated statistical averaging techniques.

(U) Strong evidence emerged in this study that certain individuals using certain techniques were capable of narrowing down the area of target location to a statistically significant degree, indicating the basic viability of the psychoenergetic approach as a search tool.

C. (U) Recommendations for Follow-On Actions

(U) Given the quality of response to the search task, and the observations emerging from detailed examination of various facets of that response, the following recommendations for follow-on actions are offered:

1. Since various individuals showed "preferences" for various tasks (as far as their capabilities were concerned), examine personality profiles obtained for these individuals, and determine by testing with other individuals if personality structure is an important factor.

2. Given the apparent relative insensitivity to RVer-target baseline distance emerging in this pilot work, examine this variable in depth in further studies.

3. Given the apparent relative insensitivity to temporal distance between RVer and target event (at least for retrospective conditions) observed in this pilot work, examine this variable in further depth.

4. Investigate further the power of statistical averaging techniques to determine whether the modest amplification obtained with such techniques to date can be improved significantly.

5. Follow up on statements by Search RVers that success is often associated with certain physiological sensations (e.g., "stickiness" in the fingers during "map dowsing"), by investigating the possibility of using physiological-correlate measures to obtain a more sensitive indicator of "signal" detection.