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Final Report--Objective E, Task 8

December 1986

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AN EXPERIMENT TO EXAMINE THE POSSIBLE EXISTENCE OF REMOTE ACTION EFFECTS IN PIEZOELECTRIC STRAIN GAUGES

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ABSTRACT

Five individuals designated by researchers from JFK University have participated in a series of remote action (RA) experiments conducted at SRI International. Each participant was asked to influence one of a pair of piezoelectric strain gauges, operating in differential mode, in order to produce an event above a predetermined threshold. Under those conditions, one of the participants produced a total of 11 signals above threshold. No equivalent, uncorrelated events above threshold were detected in control periods. Known sources of electromagnetic, acoustic, mechanical, infrared disturbance were considered and wherever possible controlled, minimized, or measured. However, some potential, but unlikely, sources of artifact such as cosmic rays or low-frequency magnetic fields were excluded from consideration in this initial series of experiments. The preliminary nature of these sessions cannot be stressed too strongly, especially because all possible sources of artifact have not been excluded. Nonetheless, our conclusion at this time is that sufficient data have been collected to warrant further investigation.

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EXECUTIVE SUMMARY

For over a hundred years, reports have appeared in the psychical literature that claim interactions with physical apparatus by mental means alone. If true, such effects will have far-reaching implications. The most direct way to examine this purported phenomenon was to attempt to replicate a claimed effect in our laboratories at SRI International. We began the process of selecting a candidate experiment by first reviewing published laboratory research on remote action (RA)*, placing particular emphasis on recent work which appeared to utilize modern instrumentation.† From our review of the literature, we selected as the most promising experiment, work claiming an interaction with a piezoelectric strain gauge. The basis for our selection was threefold: (1) A nonstatistical effect was claimed, (2) effects were supposedly produced with the subject at a distance from the sensor, and (3) a method of subject selection and training was claimed.

In the published reports, a piezoelectric strain-gauge crystal was suspended several meters from the subject. The experimenter claimed that several RA "agents" could consistently produce signals, by mental means alone, which were at least five times the background noise level. Occasional events of as much as 100 times background were also claimed. Although other experimenters have also reported nonstatistical RA effects, we were favorably impressed by the emphasis on artifact detection, at least within an extremely limited equipment budget. In subsequent conversations, the experimenter, J. Isaacs, was very willing to discuss additional potential sources of artifact and methods of control.

We formulated a "joint-venture" approach to replicating these claims by awarding a subcontract to John F. Kennedy (JFK) University where J. Isaacs is currently teaching. The task was to screen, assess, train and make available to SRI International promising RA subjects. SRI International retained the task of designing and constructing all experimental hardware. In addition, a series of trials that would be conducted at SRI, under SRI's supervision, were required at the end of the contract year. We agreed in advance that the

*In the parapsychological literature, such effects are usually associated with the term psychokinesis (PK). However, to be consistent and parallel with remote viewing, we have adopted the term remote action.

† Radin, D. I., May, E. C., and Thomson, M. J., "Psi Experiments with Random Number Generators: Meta-Analysis Part I," *Proceedings of the 28th Annual Convention of the Parapsychological Association*, pp. 199-234, Tufts University, Meford, MA (August 1985).

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outcome of those trials would determine whether the evidence was sufficient to warrant proceeding with further experiments.

In considering the problem of validating (or invalidating) controversial claims for the existence of paranormal phenomena, SRI recognized two distinct but related, obstacles: (1) No *single* experiment, no matter how impressive the results, could serve to prove or disprove the existence of RA, and (2) no single *initial* experiment, no matter how cleverly contrived, could claim to have eliminated or controlled all possible sources of artifactual data. This realization prompted us to adopt a modest goal that we believe is realistic as well as cost effective: We required the hardware and protocols to be sufficiently rigorous such that the presence of any uncorrelated events would warrant continued investigations. Our working definition of "uncorrelated events" was any signal that could not be ascribed to a source normally occurring in the laboratory environment. We did not believe that, at that time, there was sufficient evidence of an RA effect to justify the enormous expenditure of funds and effort required to address every conceivable source of artifact. Our null hypothesis was that no uncorrelated events should be detected, at least for those factors with a routine origin. At no time did we conceive of this effort as "proof" of the existence of RA. Examples of such sources of artifact and the method of control are:

SOURCE	REMEDY
ac-line transients	Battery power for critical components, fiber-optic signal links, shielded enclosures
Audible-frequency acoustic artifacts	Sensor isolation in another room, enclosed sensors, audio taping of all sessions
Motor-frequency (30-Hz) mechanical vibrations	Three types of vibration-damping mounts for isolation above 10 Hz
rf transmissions	EMI-shielded sensor enclosures and windows

A total of 20 trials, each lasting about 90 minutes, were conducted at SRI. Five subjects provided by JFK participated in those experiments. During those trials we detected 11 events that exceeded our determined threshold (six times the noise background) and that did not correlate with any of the sources of artifact we examined. In approximately 30 hours of control trials, conducted under the same circumstances except for the absence of humans, no equivalent uncorrelated events were recorded. As a consequence we concluded that we had collected sufficient evidence to justify investigating this phenomenon further.

I INTRODUCTION

The overall objective of this experiment was to determine whether remote action (RA) effects can be induced in a piezoelectric (PZT) strain gauge.* The parapsychological literature usually refers to mental effects on material objects as psychokinesis (often abbreviated PK). However, for the balance of this report we shall refer to these putative effects as remote action.

In general, these types of RA experiments consist of four basic elements:

(1) Some system or apparatus (often a transducer) the output of which is to be affected.
(2) An individual who intends to "modify" by *mental means alone* the output of the apparatus.
(3) A feedback mechanism that displays the output of the apparatus either in real-time or after the session.
(4) An *a priori* defined analysis procedure.

A single trial that encompasses these elements might proceed as follows: The apparatus has been previously actuated, and baseline data collection has been taken in advance of the effort period. In most experiments, a sequence of effort and rest periods then follows when the participant is present. The data record is then displayed to the participant as feedback, and where appropriate, some statistical quantity such as a simple z-score is computed. During a period after the participant has departed, additional control or baseline trials are taken to determine the "normal" characteristics of the apparatus.

RA studies have traditionally been divided into two categories: (1) statistical experiments (sometimes called micro-RA) in which small effects are observed over many thousands of samples, and Macro-RA experiments in which large effects were claimed, usually on the basis of a very few trials. Although the statistical experiments have generally been the more rigorous in both protocol and hardware design, interpretation of the results is difficult. In any study in which the test of the null hypothesis is statistical, a causal relationship cannot be

*This report constitutes Objective A, Task 8, "An Experiment to Examine the Possible Existence of Remote Action Effects in Piezoelectric Strain Gauges."

assumed to exist.* As a consequence, we have surveyed the literature for examples of nonstatistical effects for which the experimental protocol also appeared sufficiently rigorous to justify further study.

The experiment we are reporting is an extension of earlier work by J. Isaacs.† In our review of published work on RA, his experiments with PZT strain gauges appeared to meet the criteria for attempting replication. In addition, Isaacs claimed to have developed procedures for selecting and training individuals who could produce these effects. In FY 1986, SRI International awarded a subcontract to John F. Kennedy University (JFK), where Isaacs is currently teaching, for the purpose of reproducing the earlier work. During the subcontract negotiations, it was decided that the experiments would be a joint venture, in which SRI designs, engineers and constructs the hardware, and JFK provides the participants. In addition we agreed that a series of trials at the end of the contract year would be carried out at SRI. The rationale for such an arrangement was to make maximum use of expertise at each institution and to protect against conscious or unconscious deception. By using the same participants and hardware at two institutions, effects might be detected at both facilities, thus providing the basis for future "built-in" replication.

The FY 1986 program consisted of a screening and preparation phase in order to refine the protocol and select participants, an evaluation phase to select the most promising individuals from the screening and preparation phase and a series of trials with those individuals in a study at SRI.

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* May, E. C., Radin, D., Hubbard, G., Humphrey, B., and Utts, J., "Psi Experiments with Random Number Generators: An Informational Model," Proceedings of the 28th Annual Parapsychological Association Convention, Tufts University, Medford, Massachusetts (1985).

† Isaacs, J., "A Twelve Session Study of Micro-PKMB Training," Research in Parapsychology, pp. 31-34 (see Appendix A).

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II METHOD OF APPROACH

A. Participant Selection and Training

Staff from JFK screened and prepared interested persons to provide participants and protocols for the evaluation phase. The details of the screening, training, and evaluation procedures may be found in Appendix C. In summary, lectures on RA were given to interested groups, followed by a "hands-on" period during which members of the audience were given an opportunity to use portable RA devices (described in Section C1). Individuals showing apparent RA ability were invited to participate further.

The JFK staff then began to train participants in RA using a prototype version of the laboratory instrument (described in Section C2) to prepare them for the evaluation portion of the program. The essential elements of the training rely heavily on the concepts of operant conditioning and bio-feedback. Isaacs' hypothesis is that providing immediate auditory and visual feedback about the state of the PZT sensor can enhance latent RA ability. In addition to training, the following items were defined during the preparatory studies: the RA effect, the thresholds for events of interest, valid data (i.e., circumstances of invalidation), and the analysis and measures of success.

Using the final version of the laboratory hardware constructed at SRI for JFK, the participants who successfully completed the first two phases were given further training and evaluation. Those individuals who performed the best were asked to participate in the series of experiments at SRI.

B. Hypotheses and Variables

In the absence of environmental interference, we postulated that selected participants would be able to modify the normal output of a PZT strain gauge nonstatistically; that is, the signal to noise ratio (SNR) was required to be substantially greater than 1, for an event to be of interest.

The independent variable was time. The dependent variable in this experiment was the overall measure of a psychoenergetic effect, as determined from the electrical output of the PZT gauge. The specific criteria were developed during the screening and preparatory phases at JFK and in calibration trials at SRI. From long baseline trials (i.e., 4 to 8 hours for a single trial) with the apparatus, we determined that the system noise was ~ 4 mV. We decided on an SNR of ~ 6:1 as the threshold for events of interest and, therefore, set the lower level discriminator at 25 mV. As will be discussed later, the system was always operated in differential mode as a mechanism for rejecting artifact. That is, the absolute value of the voltage difference in the output of the two sensors was defined as the signal of interest. Although, for psychological reasons, the participants were told to focus their attention on only one sensor, the experimenters had agreed to accept any event above the differential threshold. It was, therefore, not critical which sensor the participant actually affected, if any. It was further agreed that the only sessions that would meet the criteria for considering events of interest would be those in which the participant and sensor were located in separate, but adjacent, rooms and in which no invalidating acoustic signals were recorded on the tape-recorder.

Three types of controls were employed:

(1) The SRI formal phase experiments: environmental monitoring or shielding or both were used.

(2) Global controls: extended runs between sessions to rensure long-term system stability.

(3) Local controls: data were collected just before or after or before and after an effort session to ensure short-term stability of the system.

In future control trials, we will also collect data with an individual in the room whose attention is *not* focused on the sensors.

During the testing and installation of the laboratory instrument, it became clear that it was not possible to test for, to monitor for, or to shield against all possible sources of artifact in the initial series of experiments. Therefore, some potential, but unlikely sources of artifact such as cosmic rays or extremely low-frequency magnetic fields were excluded from immediate consideration. *Our goal was to be sufficiently rigorous to determine whether further investigation into this form of RA is justified.* The null hypothesis under test was that no events uncorrelated with obvious artifacts would be observed.

C. Hardware Construction

1. The Screening Device

The purpose of the PK screening device (SD) was to facilitate the selection of subjects exhibiting psychokinetic ability. Shielding against artifact, although of concern, was not the principal design consideration for the SD. In order to allow screening of a large number of subjects, the SD is portable and fairly rugged when packed into two typewriter-size carrying cases. It is quickly and easily assembled on a table or desk top.

The SD consists of two parts, a strain gauge sensor and preamplifier assembly and a processing and display unit. The strain gauge sensor and preamplifier assembly are suspended from a stand to provide some degree of mechanical isolation. Miniature coaxial cables connect the sensor assembly to the desktop display unit. The display unit contains the processing and display hardware and the batteries that supply the entire system. The front panel of the display unit has a digital voltmeter (DVM) that displays voltage in millivolts and a twenty-element linear LED bar graph that shows the voltage graphically on a 0- to 2-volt scale. Headphone jacks, volume controls, battery test pushbuttons, and a remote handset jack are located on the right side of the panel.

There are three forms of feedback: two visual and one audio. A DVM displays the voltage held by the peak hold circuit of the selected channel, while a twenty-element LED bar display shows the voltage in a bar graph fashion. The selected peak hold output is simultaneously converted to an audio tone that is played into two sets of headphones; one for the subject and one for the operator. Individual volume controls are provided. Once above this threshold, the frequency of the tone increases linearly with the peak held voltage. The two peak holds (signal and control) are reset by a single pushbutton. Both the "reset" and the "channel select" pushbuttons are mounted on a small hand-held cylinder connected to the processing and display unit by a 12-foot cord.

The potential participant is told to focus his attention on the suspended strain gauge and by whatever mental strategy seems appropriate, to cause the frequency of the tone to increase and the LED bar graph to rise. More details of construction of these devices may be found in Appendix A. Additional details on their use in the field may be found in Appendix C.

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2. The Laboratory Apparatus

A schematic overview of the laboratory RA apparatus is shown in Figure 1. The actual apparatus may be seen in Figure 2. In designing and constructing this instrument a number of considerations had to be satisfied:

(1) Major sources of artifact had to be shielded against and or eliminated through proper engineering.
(2) A complex system of graduated auditory and visual feedback was required.
(3) Computer printout and outputs for a chart recorder were both needed to provide a permanent data record.
(4) The need to adjust almost all session parameters (e.g. threshold, gain, etc.) required that the system be microprocessor based for maximum flexibility.

A brief description of each of the system elements is given below. More detail may found in Appendix B.

a. Sensor Pair

Since it was impossible to anticipate every possible source of artifactual data, we elected to use two PZT sensors operating in differential mode as an additional method of artifact rejection. In this mode, the absolute value of the difference between the output of the two sensors was defined as the signal of interest. An event above threshold would be detected when one of the sensors was perturbed to a greater degree than the other. The intent of this approach was to reject any unshielded transients (e.g., low-frequency magnetic fields, wide area acoustic artifacts, or building movements) that could presumably influence the sensors in a nearly equivalent manner.

Each of the two PZT crystals are suspended from a lead mass. Each of the lead masses contains a charge-sensitive preamplifier that drives a fiber-optic link. The PZTs are coated with a silicone insulator to provide electrical insulation and silver paint to provide EMI/RFI shielding.

The two PZTs/preamps/drivers are housed in a Hoffman EMI/RFI shielded enclosure of dimensions 20 x 16 x 6 inches. A shielded window (combining wire mesh and a transparent conductive coating) of dimensions 13 x 3 inches was installed so the sensor could be seen: a requirement that the JFK staff believed was psychologically important.

Rechargeable batteries supply the power for all the PZT instrumentation within the shielded enclosure.

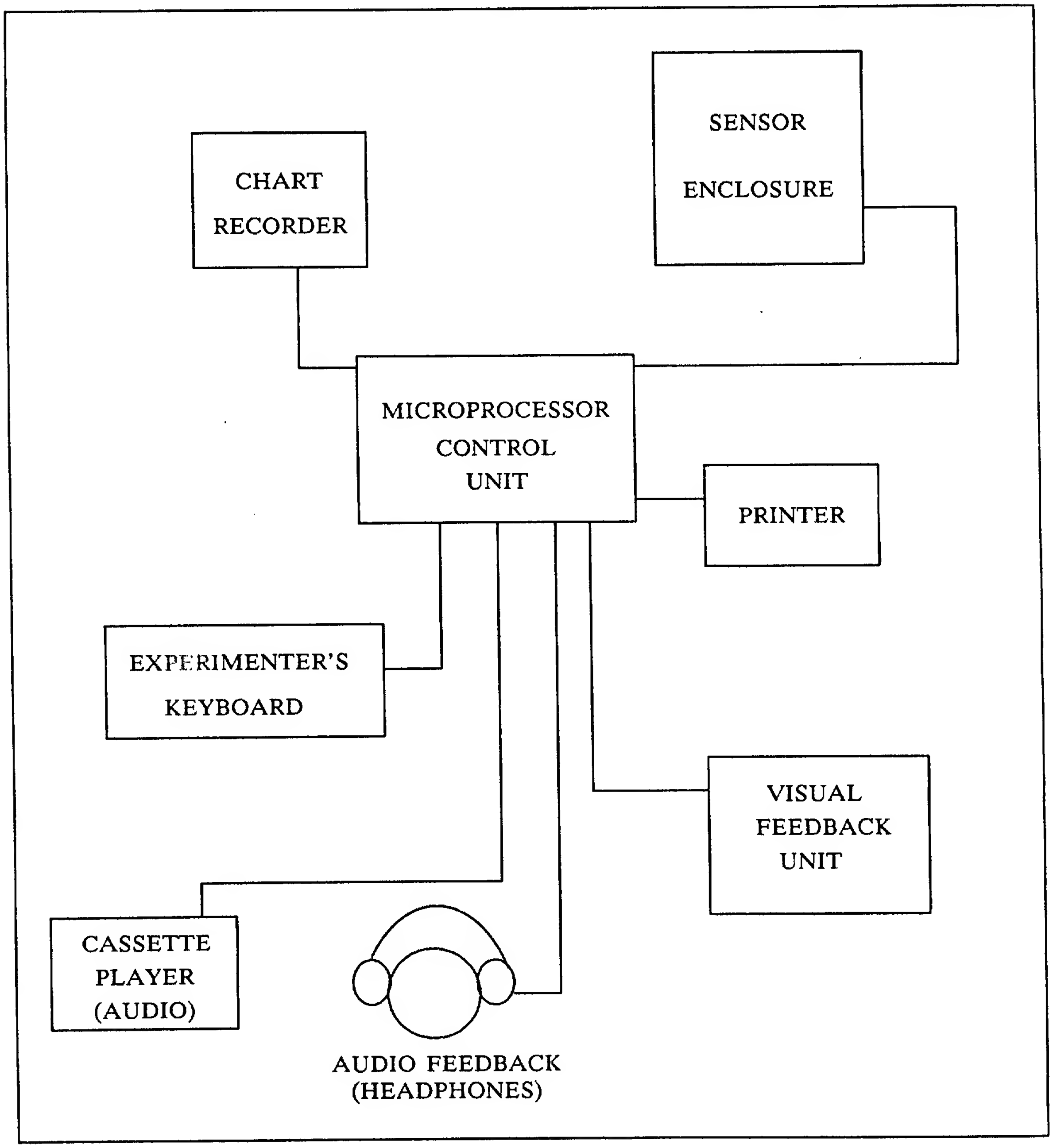

FIGURE 1 FUNCTIONAL DIAGRAM OF RA APPARATUS

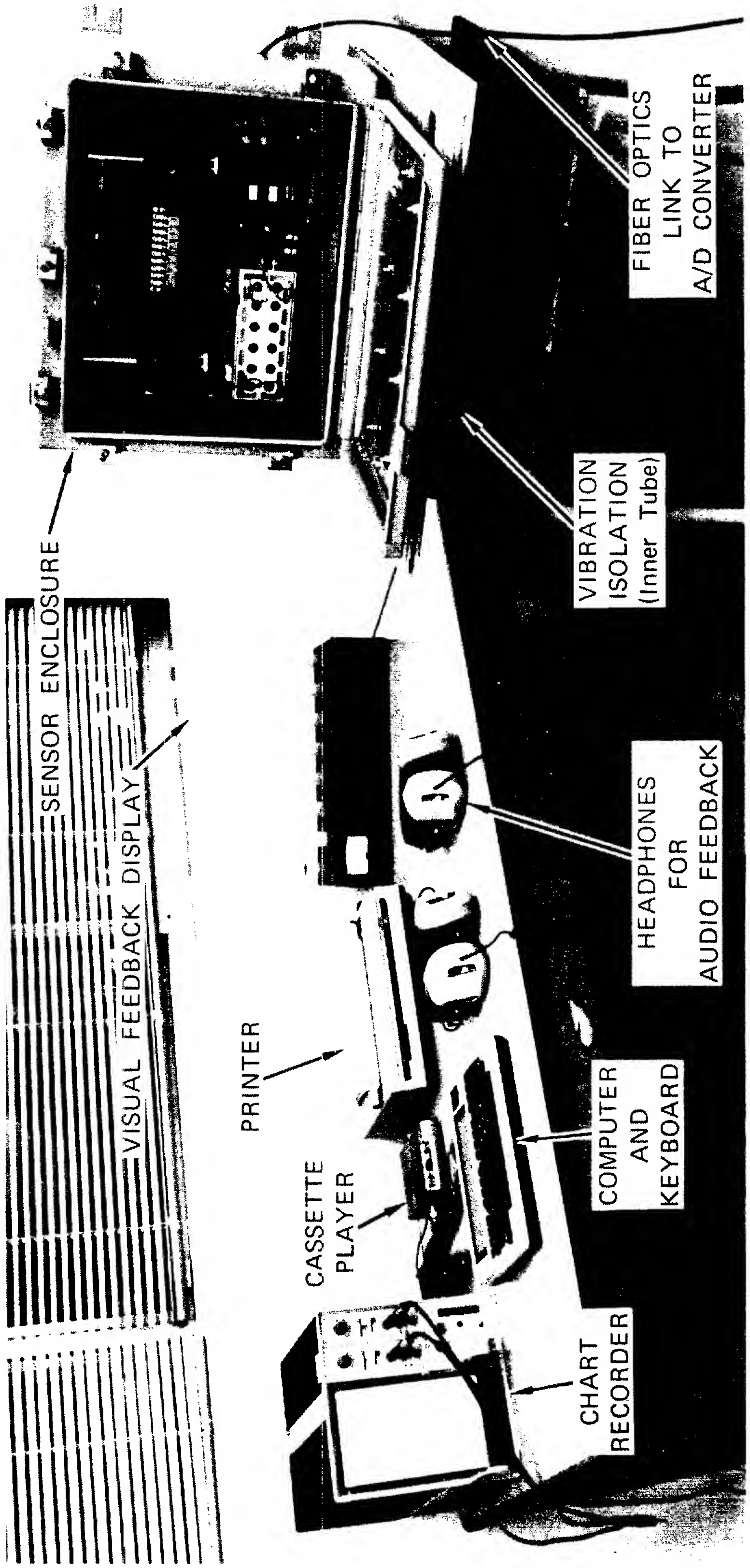

FIGURE 2 RA APPARATUS FOR PZT EXPERIMENT

Figures 3 and 4 show the entire sensor system. Details of the construction and engineering are found in Appendix B.

b. Signal Processing

The STD bus BASIC controller is responsible for all the operator interface, real time clock control, feedback control, and transmittal of data to both printer and TRS Model 102 computer. The data consist of time, voltage from sensor one (V1), voltage from sensor two (V2), and the absolute value of the difference between V1 and V2. These data are fed to two serial ports on the back of the STD controller. One port is connected to the printer, and the other is connected to the TRS Model 102 computer which stores them for future processing. The STD controller also provides chart recorder output for each of the two sensors.

The signals from the PZT sensor preamplifier are transmitted to the STD controller via two fiber optic cables. This effectively isolates the battery powered sensor and its circuitry from the line powered STD controller circuitry. The STD controller converts these signals back into voltages. This is accomplished with a fiber optic receiver followed by a frequency to voltage convertor. The signals are then filtered and full wave rectified. The software can select the high pass filter time constant, is either 100 ms or 30 ms. The low pass filter bandwidth is fixed at 1 kHz. After filtering and rectification, the signals are fed to fast attack slow decay circuits. These pulse stretcher circuits have a decay time constant of a few seconds. This is slow enough to allow both subject and operator to "view" the sensor output via the feedback, which is derived directly from the stretched signals. The chart recorder outputs are derived from the pulse stretchers as well.

At this point the two channels are digitized and the remainder of the processing is done in software. A 25-kHz analog-to-digital convertor samples the channels in rapid succession. Because of the long decay time of the pulse stretcher circuits the two channels need not be sampled in a true simultaneous fashion.

c. Feedback

There are three different modes of operation to drive the feedback: Channel A, Channel B, or differential. Channel A mode uses only the signal from Sensor A to drive the feedback. Channel B mode selects the signal from Sensor B for feedback. Differential mode drives the feedback from the absolute value of $|A - B|$. Regardless of the feedback

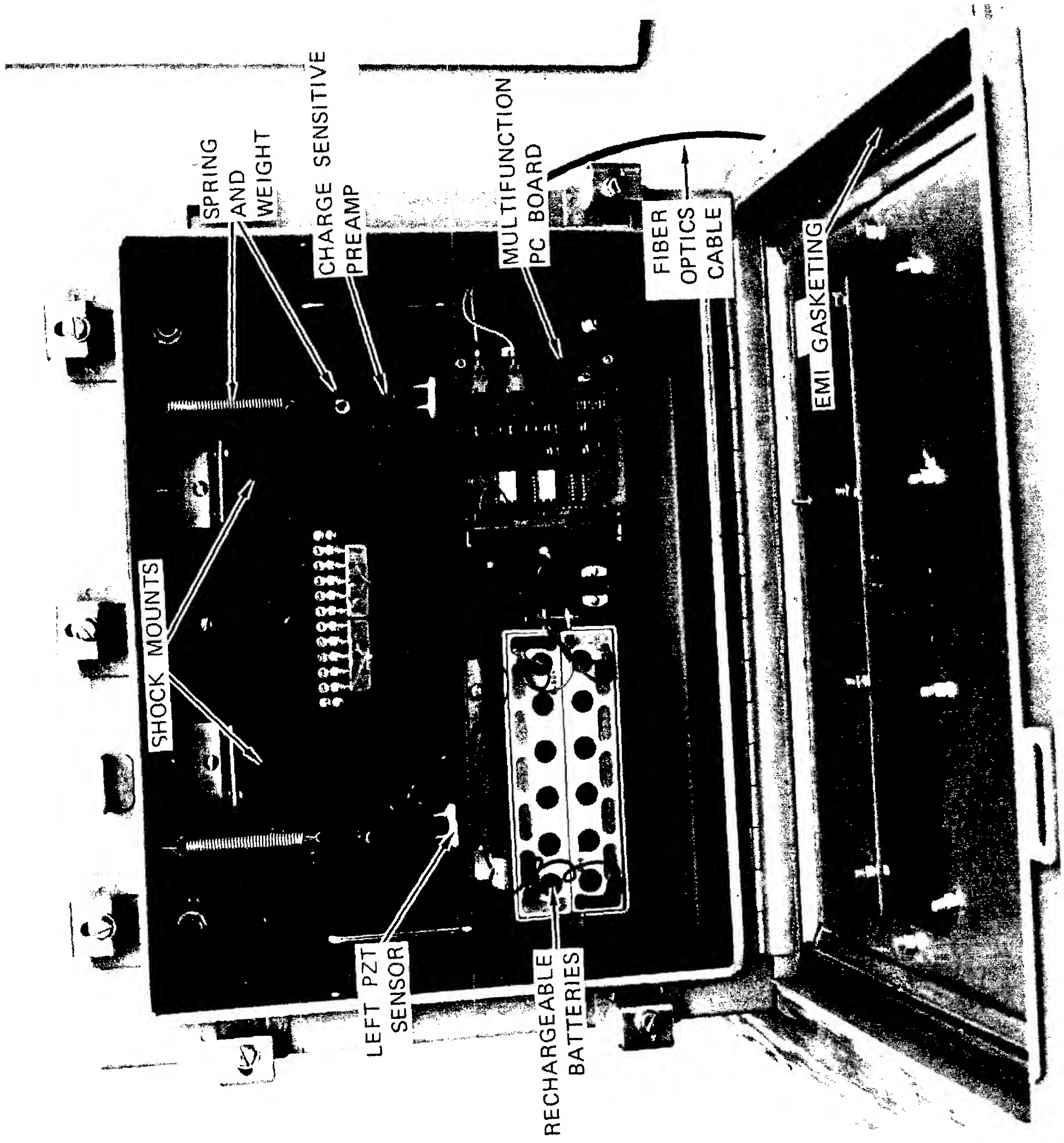

FIGURE 3 SENSOR ENCLOSURE (OPEN)

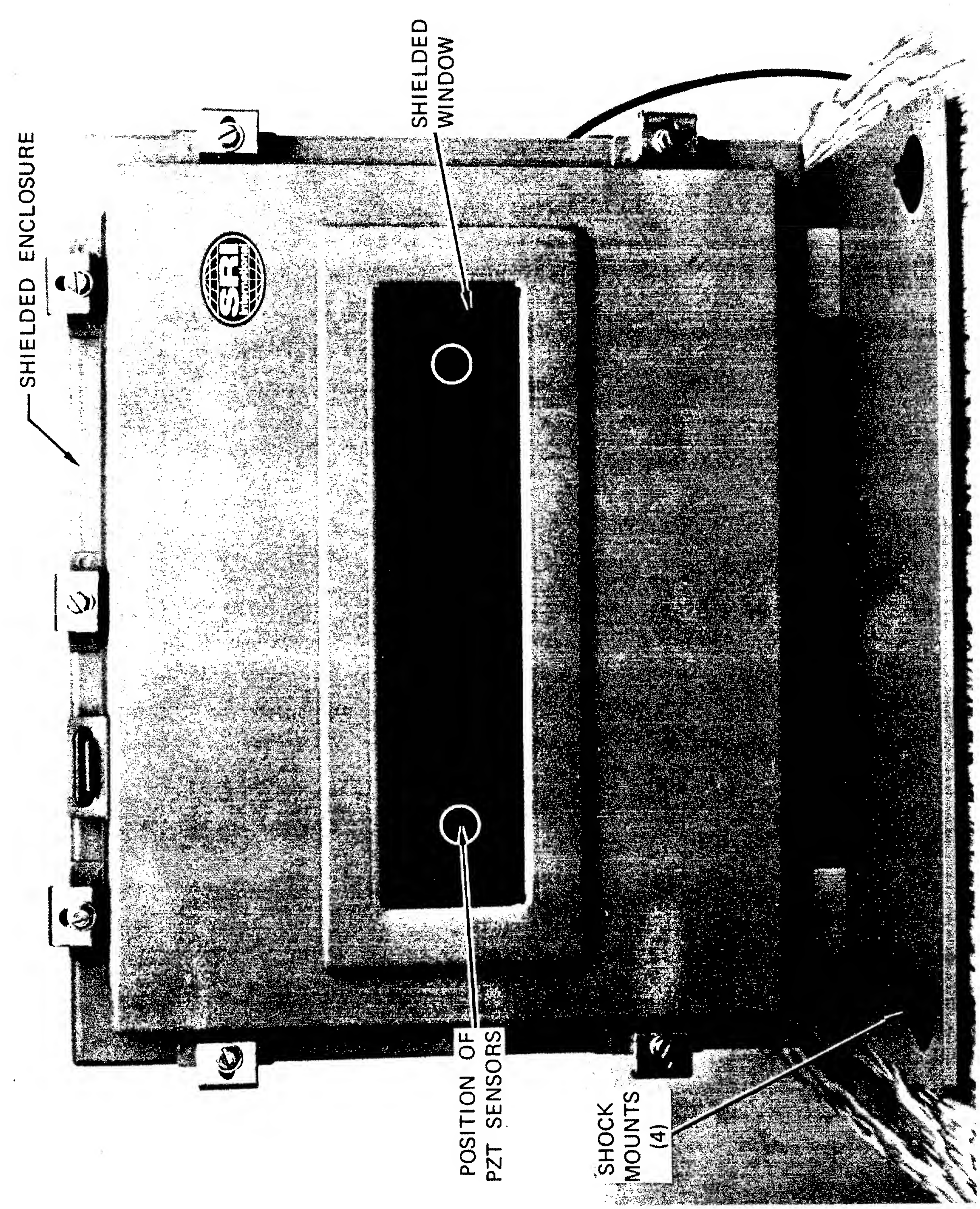

FIGURE 4 SENSOR ENCLOSURE (CLOSED)

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mode selected, the data output to the printer and TRS Model 102 computer is as described above.

For the purposes of feedback three thresholds are chosen: T0, T1, or T2 where T1 is greater than T0, and T2 is greater than T1. These threshold values can be selected by the software. These three thresholds divide the signal amplitude into four categories: $s < T0$, $T0 < s < T1$, $T1 < s < T2$, and $s > T2$. For signal values below T0, there is no feedback and no data are generated. For signal values between T0 and T1, the audio feedback generated is pink noise of increasing volume. The visual display is not active below T1. For signals between T1 and T2 both the audio and visual feedback become active. The audio feedback is a tone of increasing pitch beginning with middle C and going up an octave. The 8 colored bars of the visual display are illuminated with their respective tones. The update rate for the feedback is such that the decaying signal can be clearly seen and heard as a series of tones with decreasing pitch. Signals with an amplitude above T2 activate a cassette tape recorder and play a tape selected by the subject. The cassette will remain on for a preselected period during which time all signals from the sensors are ignored.

3. Experimental Protocol

a. Session Procedure (Typical)

Figure 5, shown below, displays the physical arrangement used during the RA experimental series at SRI. The only variations from this layout were during the first 12 sessions when the sensor box was located in the same room as the participant. The final eight sessions were conducted as shown in Figure 5.

A typical RA session lasted approximately 90 minutes. The sequence of events is shown below:

- Before the JFK experimenter/participant team arrived, the SRI session monitor checked the equipment for correct functioning and, where scheduling permitted, collected control data just before the participant. arrived.
- The period of the experiment comprised three trial periods of approximately 20 minutes and two rest periods of 10 to 15 minutes each. Rest periods were generally taken outside of the immediate area. The participant's instructions were always to attempt to affect only the left sensor.
- Following the experimental period, the SRI monitor again checked the equipment for proper functioning and, if scheduling permitted, collected more control data before the next session.

During the experimental session, the tasks of the SRI monitor were as follows:

- All session record-keeping, such as time, conditions, personnel, and the like were entered into a laboratory notebook.
- An audio, cassette tape-recorder with two microphones was employed to monitor the last 11 sessions for possible acoustic artifactual sources of signals. Recording was begun at the start of the first trial and continued through through the end of the session. The only gap in the record was the few seconds necessary to turn over the cassette.
- The monitor observed closely all aspects of the session, ensuring that the JFK team was always accompanied during the breaks and that all experimental rooms were locked when unattended.

b. Session Condition and Options

The history of parapsychology is replete with examples of conscious and unconscious deception, particularly when large-scale effects have been claimed (e.g., macro-RA). For this reason, the *principal* duty of the SRI monitor was to ensure that there were no substantive deviations from the agreed-upon protocol while simultaneously preserving an atmosphere of friendliness and encouragement. This requirement was met in part by allowing the participants to interact with the system at three levels of increasing rigor. Those three conditions are listed and discussed below. Only data collected under Condition III were considered to be of interest.

- **Condition I**--Sensors in the same room with the participant, door to the sensor enclosure open. There is no question that artifactual events are easily produced in this condition. However a key feature of the JFK approach to training RA ability is to build confidence by starting the participant with the most sensitive feedback condition possible and then by gradually introducing more restrictions. Because moving from the JFK to the SRI facility was a dramatic change in psychological setting, a few participants used this condition once as a "warm-up." Obviously data from this condition were not considered.

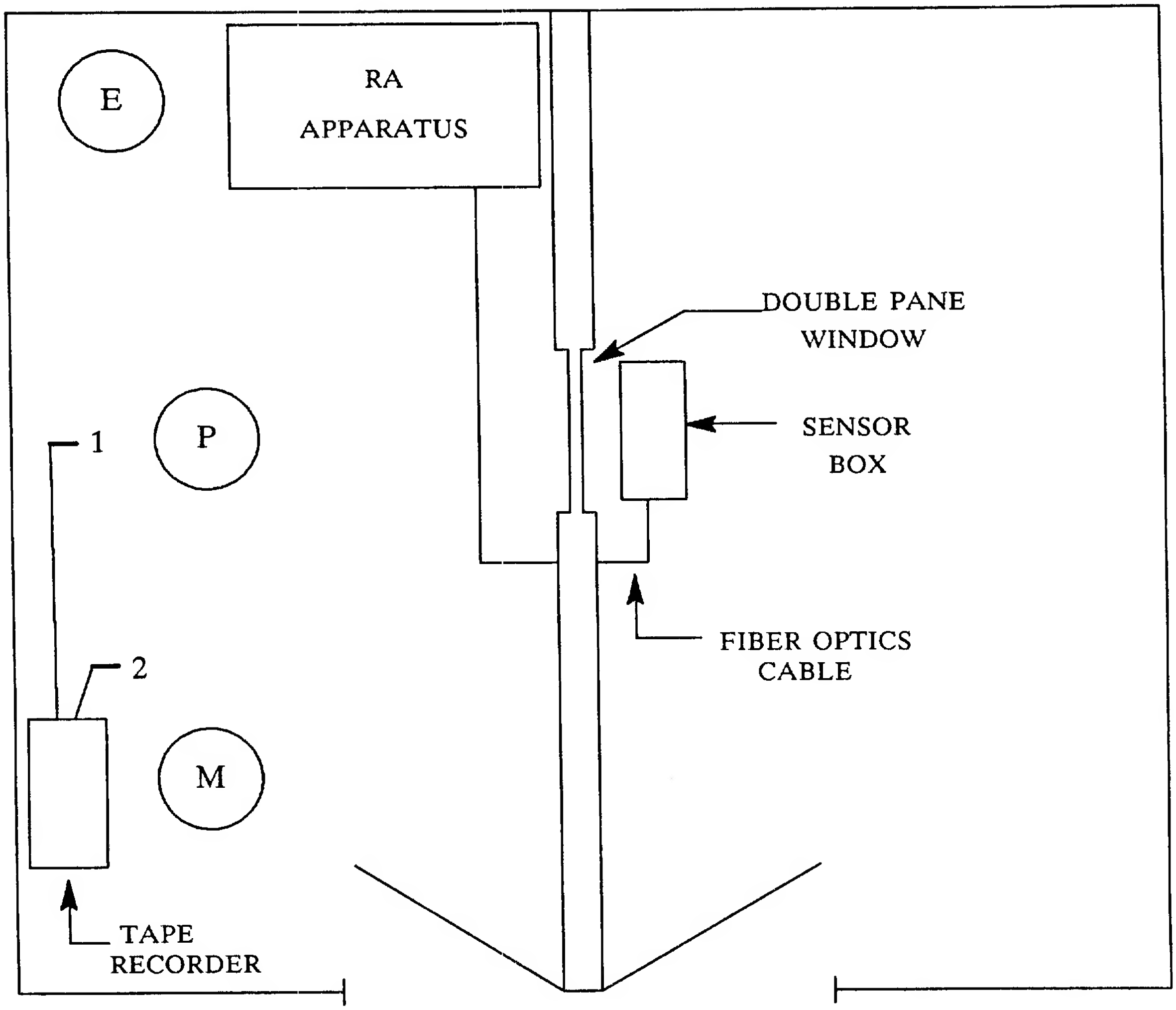

FIGURE 5 SCHEMATIC OF EXPERIMENTAL AREA FOR PZT RA. The experimenter is designated by "E," the participant by "P," and the session monitor by "M." Microphones are located at Positions 1 and 2. Ambient noise was recorded by the microphones at Position 2, audible noise or body movement by the participant was recorded by the midrophone at Position 1.

- **Condition II**--Sensors in the same room as the participant with the enclosure sealed. This condition was artifact free as long as the individuals were silent and relatively still. Although in principle one could monitor sound and motion artifact induction through appropriate video-tape recording, it was believed that such a procedure would be invasive and probably inhibitory. Because it is impossible for any human monitor to observe all possible activities of the individuals in the room, events over threshold in Condition II were discussed.

- **Condition III**--Sensors located in a temperature controlled computer room adjacent to the participant's room, enclosure sealed. The sensor enclosure was still visible through a double-pane glass window especially constructed for this purpose (cf Figure 5), a feature considered by JFK to be psychologically necessary. Considerable noise and movement could now be tolerated in the participant's area without triggering an event over threshold. However, the SRI staff felt that possible effects of combined mechanical and acoustical resonances were not well understood. As a consequence, any audio signal on the tape-recorders correlated with an RA event invalidated that data. The presence of such signals invalidated several events collected in Condition III for Subject 034. None of the other 4 participants produced *any* events in Condition III trial sessions even though 2 of them generated noises. Again, we wish to reiterate our null hypothesis. Based on our testing of the instrumentation during Condition III, we hypothesized that no candidate events would be produced in Condition III that were not rejected by our instrumentation or invalidated by our audio recording. The presence of any residual events would *not* be considered as evidence for RA but rather as motivation for continued experimentation.

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III RESULTS AND DISCUSSION

A. Individual Results

Researchers from JFK, under subcontract from SRI, provided five participants for a series of RA experiments conducted at SRI under SRI supervision. Each participant was asked to influence one of a pair of PZT strain gauges, operating in differential mode, to produce an event above a predetermined threshold. The threshold was defined as a system output of 25 mV, where 4 mV is the normal system noise. Altogether, the five participants took part in 20 sessions, each lasting approximately 90 minutes and consisting of three effort and rest periods. The last eight sessions were conducted under Condition III, in which the sensor enclosure was located in a locked room adjacent to the participant's area. At that point, the participant was approximately 3 meters from the pair of sensors. Under those conditions, one of the participants produced a total of 11 events above threshold. Those events, the largest of which was 33 mV, were in three separate efforts over two sessions on different days. Overall results for the five participants are shown below in Table 1. Because any given sessions might have trials conducted under differing conditions, we have displayed the results by trial period.

TABLE 1

Subject ID	Trials Condition I	Trials Condition II	Trials Condition III	Candidate Events*
031	0	7	2	0
032	1	14	15	11
033	1	2	3	0
034	0	6	3	0
035	1	3	2	0

*For an event to be considered, it must be over the threshold in Condition III, and not correlated with an acoustic signal.

As is obvious from Table 1, the number of sessions was not equally distributed across participants. The experimental time was heavily weighted in favor of Subject 032, who was the best participant in the preliminary trials at JFK and ultimately produced the only candidate events at SRI. Because we were seeking evidence that would support the existence of an effect we consider that we are quite justified in our division of experimental time. Should the effect continue to be observed we will of course design the experiments that have balanced conditions across subjects.

Figure 6 displays the computer printout from one of the two sessions with Participant 032 in which valid events were detected. The events of interest, which occurred in the first and third trials, are time stamped. No events occurred during the rest periods. The events are printed in the following order; left sensor output, right sensor output, absolute value of the difference. (The following letter "R" has no meaning and may be ignored.) The units in which the data are printed are computer ADC conversion units. To get millivolts, multiply by 2.5. Thus, the first event in Figure 6 is equal to 30 mV, (12 x 2.5). As mentioned earlier, the instructions to the participant were to attempt to affect the left sensor only. That this was the actual outcome is of interest although the absolute value of the difference was defined as the threshold, and therefore, either sensor could have been selectively affected to meet the event criteria.

It should be pointed out that the candidate signals occurred in clusters of 4, 4 and 3 events, respectively. In each group, the signals all appeared within 1 to 2 seconds. Therefore, the most conservative evaluation would be to say that there were 3 events rather than 11. During any subsequent experiments, we will record the above threshold voltage as a function of a shorter time scale (e.g., milliseconds) in order to more clearly identify events of interest.

During the early sessions, it was found that the chart recorder created a substantial amount of background noise, which was distracting to the participants. It had been agreed that only that data that were above the threshold as processed by the computer ADC would count as an event of interest. We therefore elected to disconnect the chart recorder for this initial series of trials to minimize the environmental distractions and reduce another source of potential acoustic artifact.

Using the charge output equations supplied by the PZT manufacturer, we have calculated the amount of energy necessary to produce an event of 30 mV from the PZT

```
GO>H
                    10 :47 :39        13 1 12 R    TRIAL 1
                    10 :47 :40        13 1 12 R    CANDIDATE EVENTS
                    10 :47 :40        12 1 11 R
                    10 :47 :40        11 0 11 R
GO>C
please enter subject's name (up to 20 characters)       : REST 1

please enter experimentor's name (up to 20 characters)  :

please enter the session number                         :

?Redo
?

GO>H
GO>H                 TRIAL 2
END OF SESSION       NO EVENTS
GO>H
GO>C
please enter subject's name (up to 20 characters)       : REST 2

please enter experimentor's name (up to 20 characters)  :

please enter the session number                         :

?Redo
?

GO>M
GO>H
GO>C
please enter subject's name (up to 20 characters)       : TRIAL 3

please enter experimentor's name (up to 20 characters)  :

please enter the session number                         :

?Redo
?

GO>H
                    11 :49 :24        13 2 11 R    TRIAL 3
                    11 :49 :24        12 0 12 R    CANDIDATE EVENTS
                    11 :49 :25        13 1 12 R
GO>M
```

FIGURE 6

OCTOBER, 1986, 10:38 A.M., PARTICIPANT: 032

(including, of course amplifier gains). Such an event would require about 1.4 x 10^{-16} joules, or around 900 eV. If the source of this energy were radiation, that would correspond to a low energy x-ray.

B. Control Trials

During control trials conducted after the first few experimental sessions, a building resonance that triggered events over threshold was discovered. This resonance could be excited by personnel walking in a specific area of the hallway. By additional vibration isolation (a partially inflated inner tube) between the sensor enclosure and its floor stand, this source of artifact was eliminated. For the balance of the experimental series, control trials of up to six hours in length were recorded with no one present in the experimental room but with normal activity in the rest of the building. No uncorrelated events above threshold equivalent to those detected in the experimental trials were detected in those control periods. A typical example of the chart record obtained during these control periods is shown in Figure 7. Note that the left sensor is somewhat noisier than the right. This extra noise probably results from small differences in the electrical contacts between the preamps and sensors. However, this small difference should not be significant because the threshold is set a factor of six above the noise of the left sensor. Certainly in any future hardware development we will attempt to further reduce contact noise.

C. Possible Sources Of Experimental Artifact

The sensor must be isolated from mechanical vibration conducted to it from the surrounding structures. Second, the sensor must be shielded from acoustic vibrations transmitted through the air. Third, thermal influences resulting from either conducted, convected, or radiated heat must be removed. Finally, because the signal of interest is an electrical charge, any external influence caused by electric or magnetic fields must be isolated.

1. Mechanical Vibration

The sensor is in a laboratory environment, coexisting with many humans and equipment such as elevators, motor-driven machinery, vehicles, and the like. The building is in an urban area in which large truck and train traffic, as well as aircraft, pass nearby. Because considerable motion vibration exists in the floor of the room in which the sensor is located, the sensor had to be isolated.

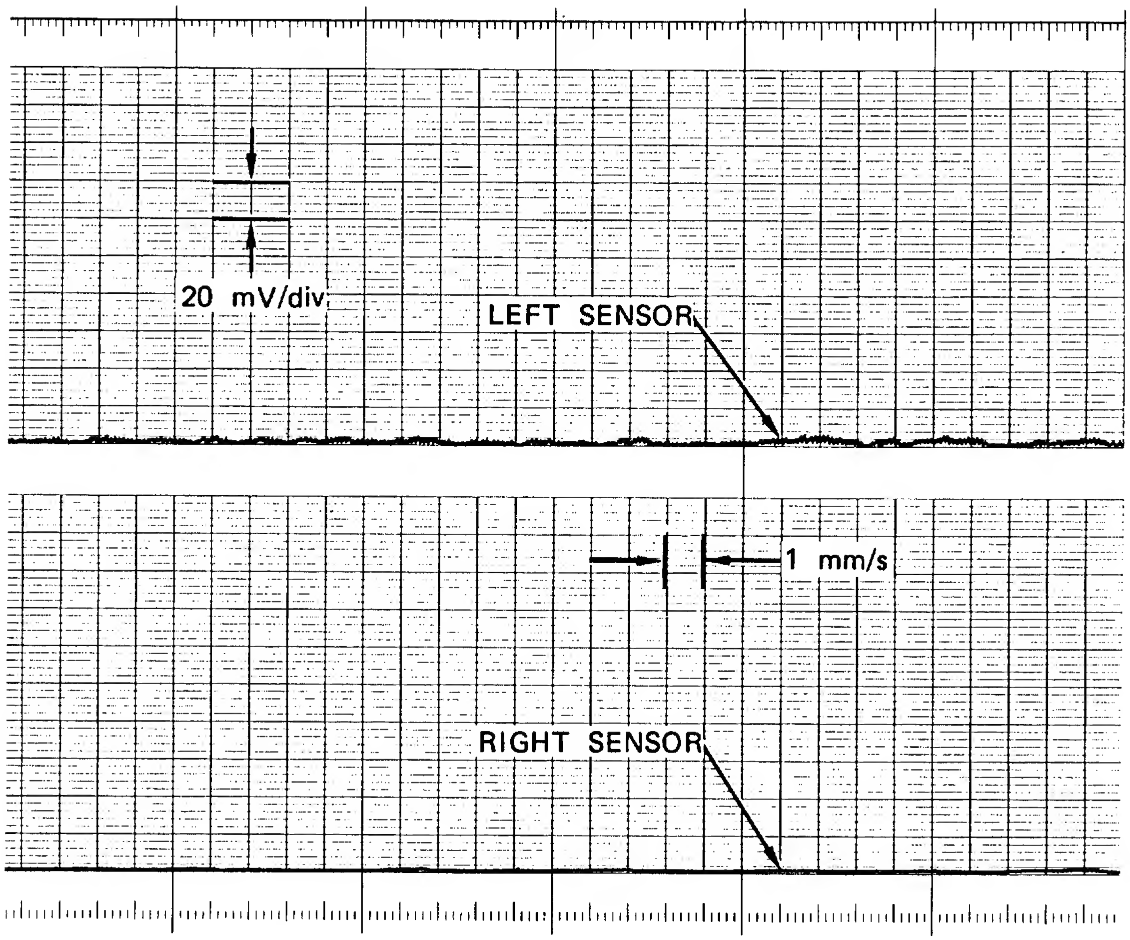

FIGURE 7 TYPICAL CONTROL-SESSION DATA

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The first level of isolation is the sensor enclosure shock mounts. These mounts consist of four commercial elastomeric pads. The enclosure weighs about 100 lbs, including the internal batteries. Weight per mount, resonant frequency, spring rate, static deflection, and isolation efficiency entered into the selection. The enclosure/mount resonance frequency is no more than 10 Hz to ensure reasonable isolation of rotating machinery components at 30 Hz.

The next level of isolation is the sensor suspension system, which is a spring-mass type with a much lower resonance frequency than the enclosure. The sensor is attached to a bob weight that is suspended from the top of the enclosure via a spring. The weight is about 2 lbs; the spring rate was selected to provide a resonance frequency of about 2 Hz. This provides an additional isolation factor of about 12 dB (6 dB/octave) at the enclosure resonance frequency assumed to be about 10 Hz. Beyond 10 Hz, the overall isolation is the sum of the two (12 dB/octave).

Extension springs are not characterized for torsional spring rate; however, a check of nearly identical size torsion and extension springs does yield an estimate. For the metallic spring selected above, the torsional spring constant is about 0.1 lb-ft/radian. Assuming that the sensor weight is a 2-lb lead sphere, the rotational moment of inertia is about 1.0×10^{-4} lb-ft-sec^2, which implies that the rotational harmonic frequency is around 5 Hz.

Isolation from low-frequency vibrations (such as those induced by footsteps and vehicle road "rumble") is not easy to provide. In this case, the assumption is that the energy below 10 Hz (the electrical signal lower frequency cutoff point) will not be so large that it masks the noise that will be visible above 10 Hz. As mentioned earlier an extra vibration isolation element was added to eliminate some specific ambient artifacts.

2. Acoustic Vibration

Just as for mechanical vibration, acoustic energy can easily cause the PZT sensor to produce noise signals if the sounds are allowed to impinge upon the PZT element directly.

Since this is the case, it would seem obvious that the PZT sensors should be heavily isolated, perhaps by being encased in lead or other sound deadening material. This approach could *not* be followed since it was considered a necessity that the participant be in visual contact with the sensors.

As the participants gain confidence in interacting with the apparatus, it is contemplated that more restrictions can be introduced. For the present experiment however, we believe that we were successful in controlling acoustic artifact through the following steps:

- Isolation of the sensors in a hard, steel enclosure that reflects higher frequency sounds.
- Isolation of the entire sensor enclosure in another room (Condition III).
- Tape recording of all Condition III sessions.

The final step of rejecting any acoustic correlated events was added as a measure of extra caution. Qualitative experimentation demonstrated that, in Condition III, a substantial amount of noise and movement was required to trigger an artifact from *inside* the participant's room. However, we could not quantitatively measure the audible sound pressure level and frequencies necessary to generate an artifact at the time of the experiment. Consequently, the use of the tape recorder to reject any events correlated with room noise appeared an appropriately conservative measure.

A small amount of conformal coat elastomeric rubber was also applied as a sound-absorbing skin. In addition, the external silver-paint coat (which serves for EMI protection) serves in a small way as an acoustic reflector at the highest frequencies.

Proof of the efficacy of all these measures may be found in the control trials and testing. During the course of the testing, we duplicated all the normal ambient noises occurring *outside* the room (i.e., doors slamming, people talking, etc.). *None* of these was correlated with any artifact production.

3. Heat-Induced Variations

All of the elements that make up the analog portion of the sensor hardware are sensitive to heat in various ways. The sensor is the most critical because its physical size (mass) is very small, which means that the thermal time constant is low also. Hence, any thermal input such as an infrared "pulse" (from the subject's hand moving past the viewing window) may induce a response in the sensor if the pulse has significant spectral energy above the system high-pass filter response of 10 Hz.

Because IR is long-wave energy, it penetrates many materials and is difficult to shield. The only direct protection is the silver paint applied to the outside of the sensor over the rubber coating. However, the shielded window of the enclosure is covered by an anti-reflective coating that reduces the IR transmission. A test of waving one's hand in front of the sealed enclosure does not produce any IR artifact. Further IR isolation was provided by the isolation of participant and sensor in Condition III (see Figure 5).

4. Electro-Magnetic Isolation

Because the entire sensor system is electronic, it must be shielded from both electric and magnetic field influences. No high-voltage or large-current devices are near the sensor enclosure, and all electrical devices within 100 feet meet the FCC minimum requirements for RFI emission suppression. The primary danger from stray fields (field-to-cable coupling outside our shielded enclosure) is eliminated entirely by using fiber optics cables to carry the signal to the external hardware.

The primary shield against EM signals which might affect the PZTs is the basic sensor enclosure, which is a standard industrial NEMA 12 steel RFI-specified box. According to the manufacturer's data book, this box provides up to 95 dB of magnetic-field shielding from 14 kHz up to 1 MHz, and over 100 dB of shielding for electric fields from 14 kHz up to at least 450 MHz. These levels of performance are degraded if any openings are made in the steel case. The viewing window in the front of the box is of a special EMI/RFI material (metallized and containing an embedded metal mesh). The manufacturer's specification for the shielding effectiveness (SE) for electric fields is about 80 dB up to 10 MHz. The SE for magnetic fields varies from about 10 dB at 100 kHz to about 45 dB at 10 MHz. Clearly, low frequency magnetic fields directly in front of the window could be a problem. However, the PZT is a capacitive element, not resistive and, therefore, should be relatively insensitive to such fields. In future studies, as the participants gain confidence, we should be able to use an unmodified windowless enclosure. Power resides inside the box in the form of chemical batteries, and the only other holes through the shell are two 1/4-inch openings for the fiber-optic cables. A straightforward calculation can demonstrate that signals must be greater than about 10 GHz to propagate through these openings.

Because of internally generated EM fields (from the dc to dc convertors and the fiber-optic driver electronics), the sensor and preamplifier are totally enclosed within a metallic shield. This shield is a combination of the lead bob weight or the silver-paint coat; neither of which afford any magnetic shielding. Because all interconnect wires are shielded coaxial or multiconductor cables, they are relatively immune to extraneous fields. A single-point common "ground" was used to minimize "ground loop currents" and the associated signal noise voltages. The critical low–noise preamplifier is powered from batteries only.

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IV CONCLUSIONS

Five individuals designated by researchers from JFK University have participated in a series of RA experiments conducted at SRI. Each participant was asked to influence one of a pair of piezoelectric strain gauges, operating in differential mode, to produce an event above a predetermined threshold. Altogether, the five participants contributed 20 sessions, each lasting approximately 90 minutes. The last 8 sessions were conducted in Condition III, in which the sensor enclosure was located in a locked room adjacent to the participant's area. At that point the participant was approximately 3 meters from the sensor pair. Under those conditions, one of the participants produced a total of 11 events above threshold. Those events, the largest of which was 33 mV, were distributed into three separate effort periods over two sessions on different days.

Known sources of artifacts (electromagnetic, acoustic, mechanical, and infra-red) were considered and, wherever possible, controlled, minimized, or measured. However, some potential but unlikely sources of artifact such as cosmic rays and low-frequency magnetic fields were excluded from consideration in this initial series of experiments.

The preliminary and pilot nature of these sessions cannot be stressed too strongly, especially since all possible sources of artifact have not been excluded. Nonetheless, our conclusion at this time is that sufficient data have been collected to warrant further investigation.

Future studies will heavily emphasize further shielding, detection of rare events that may produce artifacts, possible testing of the apparatus against standard EMI specifications such as MIL STD-461b or TEMPEST, and detection of subaudible acoustic artifact production.

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Appendix A

STRAIN GAUGE REMOTE ACTION SCREENING DEVICE

by

Steven M. Ohriner

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General Description:

The purpose of the RA screening device (SD) is to facilitate selecting the subjects exhibiting RA ability. The individuals selected using the SD are to be subsequently tested and trained using the RA laboratory instrument.

Shielding against artifact, although of concern, is not the principal design consideration for the SD. So that a large number of subjects can be easily screened, the SD is portable and fairly rugged when packed into its two typewriter-size carrying cases. It is quickly and easily assembled on a table or desk top.

The SD consists of two parts: a strain gauge sensor and preamplifier assembly and a processing and display unit. The strain gauge sensor and preamplifier assembly are suspended from a stand to provide some degree of mechanical isolation. Miniature coaxial cables connect the sensor assembly to the desktop display unit. The display unit contains the processing and display hardware and the batteries that supply the entire system. The front panel of the display unit has a digital volt meter (DVM) that displays voltage in millivolts, and a twenty-element linear LED bar graph that shows the voltage graphically on a 0-to-2-volt scale. Headphone jacks, volume controls, battery test pushbuttons and remote handset jack are located on the right side panel.

Strain Gauge Sensor and Preamplifier:

The strain gauge sensor is an aluminum strip (3 inches x 3/4 inches x .016 inches) on which two Omega Y series foil strain gauges have been mounted. These strain gauges have a coefficient of thermal expansion matched to aluminum. The gauges are mounted side by side and oriented parallel to the long (3-inch) axis. The aluminum strip is anchored to a shielded aluminum enclosure (1 inch x 3 inches x 5 inches) that houses the preamplifier circuitry. A small coaxial cable connects each of the two gauges to the bridge and preamplifier circuitry located inside the shielded enclosure. These cables were kept short (2 inches) to minimize sensitivity to electromagnetic fields.

The two gauges are connected in serial to make up one leg of the bridge. The three other legs are made up of 240-Ohm resistors. The bridge output is ac-coupled to a Burr Brown

INA-110 instrumentation amplifier. The INA-110 has a common mode rejection (CMR) of 106 dB and is configured for the maximum gain of 500 using precision trimmed internal resistors. In addition to providing gain, the INA-110 converts the differential signal from the bridge to a single ended signal. An additional gain of 100 is applied by a TL064 operational amplifier followed by a unity gain buffer to serve as a line driver. Thus, the sensor preamplifier applies an overall gain of 50,000.

At room temperature, the thermal noise of a 240-Ω resistor is 2 nV√Hz. The noise voltage of the INA-110 is 10 nV Hz. Clearly, the noise voltage of the instrumentation amplifier is a factor of five greater than the thermal noise of the sensor. System tests showed that the noise floor is limited, not by the INA-110 but by the sensor environment (mechanical vibrations and audio noise).

A high-pass filter with a 100-msec. time constant, and a low-pass filter with a 0.1-msec time constant preceed the instrumentation amplifier. The high-pass filter rejects artifacts that are caused by differences in expansion coefficients between the aluminum strip and the strain gauge due to variations in room temperature. The low-pass filter rejects noise as well as pulses shorter than 0.1 msec. The resonant frequency of the aluminum strip is approximately 20 Hz. Exciting the sensor strip mechanically with a pulse narrower than 0.1 msec (which is the low-pass filter bandwidth) will produce a response with an envelope at the resonant frequency of the strip or 20 Hz. This is within the bandwidth of the low-pass filter.

The circuitry described above is that for the signal channel. There is also a control channel. The control channel is identical to the signal channel with this exception: the two strain gauges are replaced by two 240-Ω resistors. Elements of one channel are located in close proximity to those of the other channel so that any signals induced by local electromagnetic (EM) fields disturb each channel equally. The two resistors used in place of the strain gauges are mounted next to the strain gauges on the aluminum strip.

Batteries provide the power to drive the sensor circuitry in the processing and display unit. An 8-volt regulator in the sensor enclosure is used to derive the bridge voltage. By connecting the two strain gauges in series, the voltage across them is kept to only 4 volts, well below the 9 volt maximum specified.

Processing And Display Unit:

The function of the processing and display unit is to take the sensor outputs from the preamplifiers and feed them back to the operator in real time. The amplified signals from the sensor preamplifiers enter the processing and display unit and are again amplified by a factor of three for an overall gain of 150,000. After amplification, the signals are injected into a low-pass filter 660 Hz with a rolloff of 12 dB per octave. To complete the signal processing, a full wave rectification and peak hold are done on each channel.

The signal processing functions described above are realized by two identical channels of hardware: one for the signal channel, and one for control. From this point on the hardware is shared between the two channels. The operator chooses the desired channel with a pushbutton toggle switch.

There are three forms of feedback: two visual and one audio. A DVM displays the voltage held by the peak hold circuit of the selected channel, while a twenty-element LED bar display shows the voltage in a bar graph fashion. The selected peak hold output is simultaneously converted to an audio tone (using a V to F converter), which is played into two sets of headphones: one for the subject and one for the operator. Individual volume controls are provided. The threshold for the tone can be is adjusted via an internal resistor. Once above this threshold, the frequency of the tone increases linearly with the peak held voltage. The two peak holds (signal and control) are reset by a single pushbutton. Both the "reset" and the "channel select" pushbuttons are mounted on a small hand-held cylinder connected to the processing and display unit by a 12-foot cord.

The screening device is powered by three different batteries. A 9-volt alkaline battery with a lifetime of 6 months powers the DVM. The negative 12 is supplied by two 12-volt smoke alarm batteries connected in parallel. These provide 25 hours of continuous operation. A 12-volt 2.6-amp hour rechargeable gel cell supplies the +12 and +5 volts. A fully charged battery will provide 10 to 20 hours of operation depending on LED usage. A battery test pushbutton and a battery select switch (+12 or −12 volt) display the selected battery voltage on the front panel DVM. The DVM is equipped with a "low battery" indicator for the 9-volt alkaline cell that powers it.

Performance:

Testing in the Geoscience And Engineering Center demonstrated that with the high degree of sensitivity built into the electronics, noise tended to be a problem. By reducing the low pass filter bandwith to 660 Hz, thermal noise at the output is theoretically reduced to 200 mV. With a 2-volt full-scale voltage, this poses some obvious problems. Fortunately because random thermal noise will be present on both channels, the control channel can provide a baseline to which the signal channel may be compared. With the SD on a table in our laboratory, which is not a particularly quiet environment readings as high as 300 mV were recorded. We believe these signals were produced by the ventillation system and ambient noise.

Aside from thermal noise, there is of course mechanical vibration of the table on which the sensor stand rests as well as acoustic noise. The sensitivity of the screening device is such that air currents, particularly those normal to the aluminum strip surface, produce measurable strain. These effects can be minimized by training the operators prior to subject testing.

The effect of electromagnetic fields on the screening device proves to be minimal. Keeping the connections between the gauges and preamplifiers short, the use of coaxial cable, and shielding the sensor circuitry in its enclosure, together provide good electromagnetic isolation.

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Appendix B

ENGINEERING CONSIDERATIONS AND CONSTRUCTION DETAILS OF A PIEZOELECTRIC SENSOR SYSTEM

By

Philip B. Bentley

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Background

The requirement for an RA phenomena measurement and for the monitor set has been established, and most functional and some aspects for form and fit have been delineated. This technical note describes the design details of the sensor section of the instrument.

Sensor Type

The sensor is a version of the standard commercial PZT ceramic element offered by several manufacturers in a variety of shapes, sizes, and configurations for applications ranging from high-voltage generators to low-level sound pickups.

The sensor is a Piezoelectric Products R101S, with dimensions 1 x 0.125 x 0.005 inches. This PZT is designed to produce an electric charge when it is flexed laterally and so it is assumed that such motion (or its equivalent) is the mechanism by which the RA agent influences it. Mounting the element is therefore in keeping with that mode of physical motion.

The mechano electrical characteristics are given in the data sheets; the salient parameters are:

- Electric Charge output vs. force F (free-flexure mode) $(0.18 \times 10^{-3}) \times (L)^2$ μC/N
- Electric Charge output vs. deflection z,
  23/L μC/mm,
  where L is the node-to-node beam length in mm.

The free-flexure mode assumes a fundamental symmetrical flexing about two nodes near the free ends. The driving force is considered to be applied at the center of the "beam."

The applied force F is in newtons, whereas the deflection z is in millimeters. As can be seen, the output charge is very small, especially when one calculates the allowable deflection z to remain in the safe linear operating range. For example, using an element 10 mm long (L), l = 5.5 mm and the center deflection z must be limited to a small fraction (< 0.01) of that length. Thus, the largest charge from the element is about 0.04 micro μC.

The minimum charge (hence deflection) is dependent upon the noise contribution of the amplifier used to bring the signal response up to a usable level.

The sensor has natural fundamental and harmonic resonance frequencies that can be calculated once the physical dimensions are known. Again, using the size numbers from the preceding paragraph, a typical fundamental nodal-support frequency is around 85 kHz. However, it is of no importance to the present application because the expected RA source driving function "duration" (at least the observed one) is in the range of a few milliseconds to a few tens of milliseconds. Thus, the sensor appears as a virtual flat-amplitude charge generator with respect to the frequency bands of interest (10 Hz to 1 kHz).

Signal Amplification

Because the sensor is a charge generator that has essentially a pure capacitive source impedance (well below resonance), the most appropriate signal amplifier is an operational amplifier configured as a charge amplifier. The feedback elements were chosen to effect both the low- and high-pass filter corner (-3 dB) frequencies of 1 kHz and 10 Hz, respectively. Because the charge quantities involved are very small, the amplifier input bias and noise currents are as small as possible.

Again, because there was no specification as to the level of the RA-induced deflection that could be expected, the approach was to choose the very best low-noise operational amplifier available and calculate the minimum equivalent deflection "noise." The equation for a charge amplifier using a 10 pF feedback capacitor yields a transfer gain of 0.1 V/pC. Assuming a 1000 pF coupling capacitor and a 20 M-Ω bias feedback resistor, we obtain a high-pass filter corner frequency of 8 Hz and a low-pass filter corner frequency of 800 Hz. The configuration yields unity voltage gain and a current transfer gain of 20 V/μA.

A high-quality, low-noise, low-bias-current operational amplifier has an equivalent input noise voltage of a few microvolts rms. Hence, the output noise voltage will be the same (unity voltage gain). However, the output noise voltage due to the input noise current can be larger depending upon the value of the feedback resistor. An achievable value for the noise current of 30 fA for the 0.3-to-10-Hz band and 100 fA for the 10-Hz-to-10-kHz band implies that the output noise voltage will be about 2 μV. In this case, the noise contribution due to the input noise current is about the same order of magnitude as the contribution from the input noise voltage.

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In any case, the equivalent noise voltage is less than about 5 μV rms, which established the sensor/amplifier sensitivity limit. Using the transfer gain value of 0.1 V/pC, the charge sensitivity is then 50×10^{-18} C rms. Using a detection noise threshold of 14 dB minimum, the minimum detectable charge is 250×10^{-18} C. Because the flexure-mode PZT element has a mechano electrical transfer constant of about 4 μC/mm, the equivalent motion for a minimum detectable signal is about 6×10^{-14} meters. A more useful interpretation is that the electronic noise is orders of magnitude smaller than the environmental noise from the PZT sensor.

Environment Isolation

As explained in the previous paragraphs, the sensor/amplifier combination allows for measuring extremely small mechanical motion. Concommitant, it is clear that for RA measurements, unless the ambient physical environmental effects are excluded from the sensor, performance is compromised.

First, and foremost, the sensor must be isolated from mechanical vibration conducted to it from the surrounding structures. Second, it must be shielded from acoustic vibrations transmitted through the air. Third, thermal influences resulting from either conducted, convected, or radiated heat must be removed. Finally, because the signal of interest is an electrical charge, it must be isolated from any external influence due to either electric or magnetic fields.

Mechanical Vibration

The sensor is in a laboratory environment, in which there are with many humans and and pieces of equipment such as elevators, motor-driven machinery, vehicles, and the like. The building is in an urban area in which trucks and trains, as well as aircraft, pass nearby. Considerable motion fromo mechanical vibration exists in the floor of the room where the sensor is located; those motions had to be isolated.

The first level of isolation is to shock-mount the sensor enclosure of commercial elastomeric pads. The enclosure weighs about 100 lbs, including the internal batteries. Weight per mount, resonant frequency, spring rate, static deflection, and isolation efficiency entered into the selection. The enclosure/mount resonance frequency is no more than 10 Hz to ensure reasonable isolation of rotating machinery components at 30 Hz.

The next level of isolation is the sensor suspension system, which is a spring–mass type with a much lower resonance frequency than the enclosure. The sensor is attached to a bob weight that is suspended from the top of the enclosure via a spring. The weight is about 2 lbs; the spring rate was selected to provide a resonance frequency of about 2 Hz. This provides an additional isolation factor of about 12 dB (6 dB/octave) at the enclosure resonance frequency assumed to be about 10 Hz. Beyond 10 Hz, the overall isolation is the sum of the two (12 dB/octave).

The above considers only the vertical motion. There are horizontal and, to a lesser degree, torsional vibration inputs from the external environment. At the present time, horizontal inputs are damped by using a pendulum mode to support of the sensor. Because the suspended arm length is 8 inches maximum, the pendulum fundamental harmonic motion frequency is about 1 Hz, which is commensurate with the vertical frequency.

The sensor/bob combination places the sensor away from the bob on a relatively long lever arm. This implies that higher–order pendulum motion is possible in the form of bob–weight rotation about the common center of mass with the sensor "swinging" laterally below. The suspension is "soft" and allows this different mode, and any lateral motion transient of the enclosure transmits this lateral mode down the spring to the bob and acts at a rotational impulse exciting this special mode.

Metallic coil springs also have their own spring–mass lateral and longitudinal motion resonances. The lateral is the simple "pinned–end beam" mode, and the longitudinal is a compressional mode. Either or both can cause energy coupling that an ideal mass–less spring does not have. (Because the overall performance was difficult to predict, the only obvious alternative was a light–weight elastomer rubber spring.)

Extension springs are not characterized for torsional spring rate; however, a check of nearly identical size torsion and extension springs does yield an estimate. For the metallic spring selected above, the torsional spring constant is about 0.1 lb–ft/radian. Assuming that the sensor weight is a 2–lb lead sphere, the rotational moment of inertia is about 1.0×10^{-4}, which implies that the rotational harmonic frequency is around 5 Hz. Again, this is low enough to ensure some isolation from machinery–induced vibrations.

Isolation from low–frequency vibrations (such as those induced by footsteps and vehicle road "rumble") is not easy to provide. In this case, the only hope is that the energy below 10 Hz (the electrical signal lower frequency cut–off point) will not be so large that it will mask the noise that will be visible above 10 Hz.

Acoustic Vibration

Just as for mechanical vibration, acoustic energy can cause the PZT sensor to produce noise signals. There is a normal level of audible signals in the room in which the sensor enclosure is located; the level is that for normal voice speech or probably less than 70 dBA. There are other types of acoustic signals/noise, but those have associated mechanical vibrations in the room structure that are of more concern (e.g., doors slammed). Some degree of isolation was necessary to provide protection from sound energy in the test instrumentation area.

The first level of protection is to ensure that the work area is quiet. It may be assumed that the ambient noise could be suppressed to 60 dBA, but on-site measurements are needed to confirm the degree of suppression. The second level of protection is that provided by the steel sensor enclosure. Any hard-material barrier reflects sound, but the degree of transmission isolation depends upon the material type, thickness, and support. Of course, the wavelength (i.e., frequency) also enters in as the lower tones are reflected less than higher ones for a given barrier thickness.

Sound absorbing material can be employed to enhance the isolation performance for the enclosure. An extremely effective material is lead due to its softness. Commercial sound absorbing panels designed for aircraft and other critical noise reduction applications can be applied to either the interior or exterior of the enclosure.

The third level of protection was to place the sound reflective/absorptive material around the sensor/preamplifier unit itself. Because the mechanical support system calls for a bob weight for the spring/mass isolation system, that weight can take the form of a hollow lead bob within which is placed the preamplifier and associate circuit components that may be microphonic.

Unfortunately, the sensor itself must be "visible" and, therefore, cannot be placed inside the lead bob weight. Only a small amount of conformal-coat elastomeric rubber was applied as a sound-absorbing skin. The external silver-paint coat (which serves as protection against EMI) also serves in a small way as an acoustic reflector. However, the thickness of these "skins" is quite small and does not provide much reduction in acoustic energy except at the highest frequencies.

Of course, the ultimate sound elimination method would be to place the sensor in an evacuated chamber such as a light bulb. The limitation of this approach is that conductive wires must exit the bulb and, therefore, constitute a sound (albeit mechanical) transmission medium. Previous work indicated that the cost and bother of such an approach was too high relative to the degree of performance obtained.

Heat-Induced Variations

All of the elements that make up the analog portion of the sensor hardware are sensitive to heat in various ways. The sensor is the most critical because its physical size (mass) is very small which means that the thermal time constant is low also. Hence, any thermal input such as an infrared (IR) "pulse" (from the subject's hand moving past the viewing window) can induce a response in the sensor that has significant spectral energy above the system high-pass filter response of 10 Hz. Because IR is long-wave energy, it penetrates many materials and is difficult to shield. The only protection for the sensor itself is the silver paint applied to the outside over the rubber coating.

The preamplifier is also very sensitive to thermal changes, as well as the discrete components (resistances and capacitances) that make up the feedback and coupling circuitry. Here, the best isolation is provided by tying all of those elements to the lead bob weight either directly or via thermally conductive materials. So long as the rate-of-change of the bias current is less than a few picoamperes per second, no effect is visible in the final signal bandwidth output. Because the preamplifier is operated as a current amplifier, it has unity voltage gain; therefore, offset voltage drift with temperature is not a major factor but still can be a problem. A typical drift rate is 50 μV/deg C, which means that the temperature rate-of-change must be less than 1 deg/sec to assure that the transient is less than the rms noise (about 2 μV). Good thermal bonding of the circuitry to the lead mass appeared to preclude any problems.

Electromagnetic Isolation

Because the entire sensor system is electronic, it must be shielded from both electric and magnetic field influences. No high-voltage or large-current devices are near the sensor enclosure, and all electrical devices within 100 ft meet the FCC minimum requirements for RFI emission suppression. Such an assumption may not always be correct and so it is recommended that potential areas in which the instrument will be used in the future be surveyed for large EM fields over the full electromagnetic spectrum (at least from 14 kHz to 1 GHz).

The primary shield for EM signals is the basic sensor enclosure, which is a standard industry NEMA 12 steel RFI-specified box. According to the manufacturer's data book, this box provides up to 95 dB of magnetic-field shielding from 14 kHz up to 1 MHz, and over 100 dB of shielding for electric fields from 14 kHz up to at least 450 MHz. These levels of performance are degraded if any openings are made in the steel case. The viewing window in the front of the box is of a special RFI reflective material (either metallized or with an embedded metal mesh). Power resides inside the box in the form of chemical batteries, and the only other holes through the shell are two 1/4-inch openings for the fiber optic cables.

Because of internally generated EM fields (from the dc to dc convertors and the fiber-optic driver electronics), the sensor and preamplifier are totally enclosed in a metallic shield. This shield is a combination of the lead bob weight or the silver-paint coat; neither of which afford any magnetic shielding. If necessary, the dc to dc convertor units could be mounted in steel (or mu-metal) boxes to contain any switching magnetic fields. Because all interconnect wires are shielded coaxial or multiconductor cables, they are relatively immune to extraneous fields. A single-point common "ground" was used to minimize "ground loop currents" and the associated signal noise voltages. The critical low-noise preamplifier is powered from batteries only.

Appendix C

FINAL REPORT

JFK 1986 REMOTE ACTION RESEARCH ACTIVITIES

By

JULIAN ISSACS

THE REMOTE ACTION PROJECT

GRADUATE SCHOOL OF CONSCIOUSNESS STUDIES

JOHN F. KENNEDY UNIVERSITY

ORINDA, CALIFORNIA

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I INTRODUCTION

Recapitulating the Statement of Work,[1] which describes the year's research in outline, the task was to recruit and train a number of potential piezo remote action (Piezo-RA) agents in preparation for a formal Piezo-RA evaluation study to be undertaken at John F. Kennedy University (JFK). The best seven Piezo-RA agents from this study were to be made available for participation in an SRI-based evaluation study designed to provide high-quality evidence of the existence of the Piezo-RA effect. In order to accomplish this task, population-screening procedures were to be undertaken and Piezo-RA training sessions were to be conducted. The functional designs of suitable instrumentation for screening and evaluation purposes were also to be supplied to SRI.

The research activities were, as has been freely acknowledged by the SRI and JFK personnel involved, heavily affected by the various unforeseen delays that accompanied many phases of the task. The evaluation devices were delivered in working order on 18 September 1986. This left too little time available with the high-grade instrumentation to conduct a sufficient Piezo-RA training with participants to ensure the high-level performance of trainee Piezo-RA agents or to pursue a JFK-based formal evaluation.

Therefore, the decision was made to select those participants who seemed most likely to succeed in producing Piezo-RA effects and run multiple sessions at SRI with this elite group, assigning a variable number of sessions to different participants on the basis of their availability and apparent likelihood of producing results. Abandoning of the formal evaluation in the present research cycle and adopting this highly pragmatic approach were necessitated by the goal of optimizing the chances of obtaining (within the time frame of this contract) some preliminary indications at SRI that the Piezo-RA effect is a reality.

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II POPULATION SCREENING

a. Screening Methodology

The technique of population screening for Piezo-RA ability was developed by Julian Isaacs in England and is described in detail elsewhere.[2] The basic approach used in the California screenings remains the same, but the procedure was further developed and optimized for use by a group of investigators in the American setting.

Because one of the conditions of the contract was that the link with SRI not be generally broadcast, the population screenings (which had to be publicized in order to attract participants) were advertised as being initiated by JFK. The title of "The Remote Action Project" was selected as the public title for the research activities. The screening technique in its current form used a three-stage process and seems likely to be more effective than the original form.

The first stage consists of a one-hour presentation about remote action (RA), metal-bending, Piezo-RA, and the Remote Action Project. During the first stage, several visualization exercises are performed to induce ostensible macroscopic psychokinetic metal-bending (Macro-PKMB) effects to occur. The overt purpose of the first stage is to present information about the topic areas and to provide the opportunity for those who respond to the visualization exercises to produce Macro-PKMB effects. The covert purpose is to change the audience's mood to a relaxed nonanalytical state, to induce the audience to accept the reality of RA effects and to increase expectancy of success at the later RA tasks.

The second stage consists of the move to a "RA Party" format, which is a technique orginated by G. Houck[3] for inducing ostensible Macro-PKMB effects. The audience forms a group that is instructed to collectively perform a visualization exercise while holding a piece of flatware. The flatware is subsequently "tested" for ostensibly paranormal softening by pressure being exerted on it, and by being bent while in the softened state.

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The third stage comprises the instrumental screening of the group. Typically, several screening devices are set up, either in the room in which the stage one presentation is given or in adjoining rooms. Each machine is operated by two persons. One person's role is to interact with the screenees and orient them to the task, collect each Participant Information Form (PIF) (Section III.), and supervise the line of screenees waiting their turn at the device. The other person supervises the trials and records the results on the PIFs, which are retained by the screening team.

b. **The Screenings**

Four screenings were held. The first was held in Mountain View, California, at the Trellis Singles Club on 1 March 1986. The purpose of using a location away from the JFK laboratory was to permit the first screening to be a training session for the screening team. It was felt that screenings should only be held with local groups after it was certain that the screening procedure had been successfully modified to suit the new screening team and context. The instruments used for this screening were three systems built in England, which were pressed into service because the screening instruments from SRI had not yet been built.

The audience at the Trellis screening was far from ideal. To optimize the number of potential Piezo-RA agents found, groups used for screening should have pre-existing interest in psi or experience of psi practices: "New Age," spiritually inclined, and psi-oriented and arts-based groups are optimal. The Trellis group was composed of preponderantly male semiconductor engineers and scientists (the Trellis premises are close to the Santa Clara, California or "Silicon" Valley), who were interested in the presentation, but who remained resolutely analytical and somewhat skeptical in their orientation.

The three following screenings (on 8 May, 12 June, and 11 July 1986) were at JFK and used the screening devices built at SRI. The first two of this series of three were held at the Village Campus. They were publicized by a flyer mailed to the members of the mailing list of the Graduate School of Consciousness Studies. The third, held at the Walnut Creek Del Valle Campus, was less well attended than the first two and was publicized by a flyer sent to the members of the School of Law and the School of Business Studies. The success of these screenings in generating interest and enthusiasm was attested to by the fact that several individuals attended more than one screening.

c. Criteria for Participant Selection

The screening technique has not been formalized and is not a rigid procedure; it has to be adapted to suit different situations and groups. The overall goal, which is essentially utilitarian and pragmatic, seems to be adequately met by the procedure that has been developed. Its purpose is to select from a large group of possible Piezo-RA agents those individuals who are probably capable of RA and who are prepared to participate in the experimental process. The style of presentation made by the speaker, the particular sequence of events during the screening process, and the responses of the screened group can all reasonably be expected to affect the number of individuals who are induced to produce RA effects. It is unrealistic to expect a 100% yield of those individuals who have RA ability to result from the screening process; for some of the screened group, the induction procedures will be ineffective.

Additionally, no pretense is made that the screening process is anything other than a very informal indication of possible RA ability. The procedure is certainly not resistant to cheating on the part of audience members, particularly with regard to the ostensible Macro-PKMB phenomena. Screenees who produce ostensible phenomena at a screening may subsequently show no RA ability, so that a second level of screening procedure, based on actual performance in the Piezo-RA training situation, has to be used.

The selection of prospective Piezo-RA trainees in the screenings was based on three criteria, which were used in a convergent fashion. The first criterion was the responses on the Participant Information Form (PIF) (see Annex 1), the second was the performance at an instrumented RA task, and the third was the Macro-PKMB performance.

The PIF is an inventory (of ostensible psi-related experiences) that has been formulated specifically to focus on spontaneous psi experiences thought to involve elements of RA effects. The PIF was modified twice: one modification was made between the first and second screenings, and the second between the third and fourth screenings. These changes were almost entirely of form and typographical detail, however. The first two versions had to be used in conjunction with another form, the availability form, which asked potential participants to indicate their availability for Piezo-RA training, their address, and their willingness to participate in experimentation. The final version of the PIF eliminated the separate Availability Form and combined this information on the front page with (a) a self-report about the screenee's Macro-PKMB attempts, (b) the evaluator's impression of the person as a potential RA trainee; (c) the interviewer's evaluation of the screenee's Macro-PKMB phenomena; and (d) the person's highest score on the instrumented test, if this merited recording.

The first 17 questions of the PIF attempt to elicit information about spontaneous psi experiences. Responses are categorized into four types: "No" indicates that the screenee has never had the experience cited in the question; "1" indicates that the experience has occurred once; "2" indicates "more than once, several times;" "3" indicates "often, frequently." Eight of the 17 questions are RA-specific (questions 1 through 6, 8, and 14). Questions 20, 21, and 22 request information about the person's prior practice of mental skills of various sorts (e.g., meditation, visualization, and the like), the screenee's sports, dance, and martial arts preferences, if any, and religious orientation.

The analysis of the PIF data on spontaneous psi functioning was formalized around two key concepts. The first was the concept of a "psychic" (P) profile of responses, which divided the interested persons into "psychic" and "nonpsychic" groups. The criterion of entry into the P profile was that at least seven responses in Category "2" and an additional one response in Category "1" (see preceding paragraph) should be made to the first 17 questions. It should be noted that this definition of the P group is fairly extreme and represents the selection of a group showing high levels of ostensible spontaneous psi functioning.

The second was the concept of "belief," or the degree of belief evinced by the interested person in the reality of RA, both generally, and specifically with regard to their own ability to perform RA. Question 18 asked, "Do you think it is possible to affect physical objects without touching them?" Question 19 asked, "Do you think that you can affect physical objects without touching them?" The two belief questions offer a scale of 1 to 5 to be circled for responses, with 1 being "definitely no," and 5 being "definitely yes." To enter the "belief" (B) profile population, interested persons had to respond with a value of 4 or more on question 18, and a value of 3 or more on question 19.

The use of the two profiles, B and P, creates the possibility of an elite classification "PB," in which interested persons match both profiles. Generally, participants would be accepted for Piezo-RA training only if they scored within the PB profile. The PIF data have been divided to show the P, B, and PB groups' micro-RA performance (on the screening devices) and the macro-RA (visible metal-bending) performance. This may offer the possibility of a more fine-grained analysis of the results from the screenings (see below).

The second criterion used in selecting prospective RA trainees was the score achieved by each interested person on the screening device during his or her attempt to influence it. The screening devices were sufficiently noisy so that scores spontaneously fluctuated over a range. Because the devices showed individual differences, any attempt to produce frequency plots of spontaneously occurring scores would have necessitated long runs with each device to obtain histograms of score distributions. Some pilot attempts to compile score histograms were made, and it was found that the settings in which the machines were operated affected the distribution of scores. Additionally, it was realized that the peak reading obtained would be affected by the duration of the trial and the noise spectrum of the devices.

If calibration histograms were to be compiled, they would have to be compiled for a sufficient range of durations to cover the actual durations of all screening trials likely to be performed, and the period of each trial during the screening would have to be timed. This would have considerably complicated the screener's job, because no provision for automatic timing existed, and there are good psychological reasons for permitting variable trial lengths to be performed in the instrumental screening procedure. It was realized that in order to provide calibration data that would give well-controlled estimates of the probabilities of low-end scores (i.e., scores near the noise floor of the devices), the devices would have to be recalibrated at the screening site, in the presence of the group during the actual screening, because the group's activities (especially walking, moving chairs, and the like) might affect the devices.

Given the nonformal nature of the rest of the screening process, it was, therefore felt that it was not worth the large amount of time and effort required to produce adequate calibration histogram data, especially because there was good reason to believe that real-time on-site calibration runs would be necessary, under actual screening conditions, if the calibration data were to be really meaningful.

It was decided that scores above 380 would be regarded as candidate RA, and scores at or near this level were to be regarded as suggestive of RA. Scores in this region and above were, therefore, recorded on the PIF by the screener in charge of the device. In the tabulated data, the criterion score, which allowed entry into the microeffect (MIC) category, was set at a device reading of 380.

The third criterion used to select prospective trainees, which was given less weight than the other two, was the account of the person's Macro-PKMB effects and the appearance of his or her deformed flatware. It has been frequently observed that persons do not reliably estimate the amount of physical force they exert on cutlery. Nor, often, do they appreciate how little physical force is necessary to produce deformations. The ostensible Macro-PKMB effects are, therefore, evaluated very cautiously. For the purposes of the tabulated data, the persons producing deformed cutlery were assigned to the MAC category. Those producing effects on the screening devices and on cutlery were assigned to the "MIC+MAC" category.

d. Results of Screenings

Table A-1 shows the results of the four screenings. These are labelled T (Trellis) and K1 (Kennedy first screening) through K3 (Kennedy third screening). A total of 189 individuals returned usable PIFs; the return rate was about 85%. The screenee categories are in ascending order of suitability for RA training, with the elite (PB MIC+MAC) group occupying top position, and those showing no evidence of RA, no psychic profile, and no belief, are the "residual" group at the bottom of the table.

The results are surprisingly positive overall, but of course the data must be regarded cautiously. Although the chances of successful cheating at the micro task were slight, some of the readings, were marginal and may be artifactual. It is very likely that the numbers of the B MAC and PB MAC groups are artificially inflated by believers who unknowingly bent their cutlery purely by physical force. Some 58% of the elite PB group showed some form of effect, although 25% of the group showing neither a psychic profile nor belief also produced effects. It should be remembered that the psychic profile will identify only those showing strong spontaneous psi functioning, so that the "non-psi" group may include individuals who are psi-capable.

The strongest effect in the data, which was anticipated, and which is of importance in practice, is the difference between groups. Thus 13% of the Trellis group produced some form of effect, whereas 66% of the combined Kennedy groups produced some form of effect. When this performance measure is confined to those individuals who produced microeffects on the instrumentation, only 6.5% of the Trellis group produced these effects, compared to 30% of the combined Kennedy groups. These numbers may be misleading, however, because the instrumentation used in the Trellis screening was different from that used for the Kennedy screenings. However, using another measure, the size of the residual groups, a clear difference is shown between the Trellis and Kennedy populations. The Trellis residual group constituted 38% of the overall Trellis group, whereas the combined Kennedy residual was only 7%. These results, taken as a whole, tend to indicate that the careful choice of groups to screen will maximize the yield of potential RA agents found.

Categories of Screenees	Groups Screened				Consolidated Results		
	T	K1	K2	K3	Subtls	Totals	Percent
P.B. MIC+MAC	0	5	2	4	11		
P.B. MIC	1	2	1	3	7	39	20.6 %
P.B. MAC	4	6	8	3	21		
P. MIC+MAC	0	0	0	1	1		
P. MIC	0	1	0	0	1	3	1.5 %
P. MAC	0	0	1	0	1		
B. MIC+MAC	0	0	0	2	2		
B. MIC	2	4	1	2	9	30	15.8 %
B. MAC	1	4	11	3	19		
MIC+MAC	1	1	0	3	5		
MIC	1	0	0	2	3	13	6.8 %
MAC	0	1	4	0	5		
P.B.	17	6	3	2		28	14.8 %
P.	4	0	1	0		5	2.6 %
B.	16	6	8	2		32	17.0 %
Residual	29	2	5	3		39	20.6 %
Group Totals	76	38	45	30		189	

B. = Believer Profile
P. = Psychic Profile
P.B. = Psychic + Believer Profile

MIC+MAC = Micro + Macro Effects
MIC = Micro Effects Only
MAC = Macro Effects Only

TABLE A-1 SCREENING RESULTS

The data seem to show a slight effect of belief on performance. Taking the microeffects recorded, which presumably will not be inflated by cheating, and which should show equal incidence of artifact across groups, the percentage of individuals for all groups showing belief who also produced the microeffect, 22%, slightly exceeded the percentage of individuals producing microeffects who did not show belief, 16%.

The Trellis screening did identify a number of individuals who appear to be promising potential participants and who live near SRI and who might be available for research. The JFK screenings should supply a number of participants for future studies.

e. Participant Recruitment by Contacts

Only three of the 10 participants in the training sessions under review were recruited through the screening process. However, of those three, two were good enough to go to SRI (HW and ZK). All but one of the JFK participants fulfill the PIF PB profile. The screenings performed at JFK will be of considerable use in the upcoming research cycle. To be efficient, the Piezo-RA training process requires individuals showing reasonably fast learning. The need for replacement participants for those showing poor learning performance requires the periodic intake of fresh participants; the fact that a group of potential RA trainees have already been identified by the JFK screenings will render the replacement process much more efficient.

The apparent association of good Piezo-RA performance with the PB profile perhaps suggests that a reasonable fraction of those individuals currently participating in SRI-based parapsychological studies may prove successful at the Piezo-RA task, assuming that they too show the PB profile.

f. Conclusions Regarding Selection

In practice, for purpose of selecting potential trainees, the criteria for assessment of the responses to both the PIF profile questions are complex and informal. Furthermore, a person's willingness to participate, freedom to schedule training sessions during the weekdays, place of domicile (and hence journey time to the JFK laboratory in Walnut Creek), and general attitudes, are all non-psi factors that pragmatically affect the probability of their selection.

The approach of the JFK-based research group towards participant selection and training appears to be very similar to that developed at SRI. Because a long-term commitment to

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participation is required, adult participants who are in stable social and domestic situations are preferentially selected. This approach contrasts greatly with the one-shot use of college students that seems very common in many psychological and parapsychological studies.

The recruitment of outstanding Piezo-RA agents for long periods of research at JFK would be greatly facilitated if they could be paid a stipend for participation in research. This issue has already been raised by some participants in the first phase of this research.

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III REMOTE ACTION TRAINING SESSIONS

a. Training Sessions with Modified Screening Device

The modified screening device (MSD) proved of great service in the RA training process. The feedback characteristics (audible "click" feedback, with the click rate tied to the output of the selectable crystal channel) are very suitable for RA training, because feedback from the noise floor of the system is available. Some 50 training sessions were held using this device, and the participants seemed to enjoy using it.

The MSD is very sensitive to sound and vibration and the two channels are not well matched in sensitivity. As a result, the sessions using this device cannot be used for formal data recovery. When the device is used in the same room as the participant, slight movements or noises create measurable outputs from the device. When used in a separate room, slight outputs are generated by distant doors being slammed, or movement of the participant or experimenter in the adjacent room may create small outputs.

The MSD could rather easily be revised to provide a more artifact-free response; it is suggested that improvement would be a very worthwhile investment. If the present light plastic enclosure were replaced with a massive airtight glass cover, if the cabling were replaced with a much longer cable of a more compliant type, and if a vibration-resistant mounting were developed and a sound-attenuating shield assembled around it, the device would provide an excellent training facility for beginning RA trainees.

b. Training Sessions with Twenty-Tone Device

About 20 training sessions were held using the twenty-tone device (TTD), which was built in England, and which provided the model for the design of the evaluation device (ED) feedback system. The TTD employs one piezoelectric crystal sensor strip, that is mounted near its preamplifier, that is connected by cable to the separate main signal processing unit. The TTD provides a white noise feedback signal from near the noise floor to a fixed lower threshold. From the fixed lower threshold to a selectable upper threshold, the device produces 20 tones of the tempered musical scale. Participant response to the feedback characteristics of the TTD has been universally very positive.

The TTD was designed to be used in conjunction with a stereo cassette tape recording system, one stereo channel being dedicated to the device, the other to a microphone placed in the vicinity of the sensor, which is normally mounted remotely from the TTD main signal processing unit. Scoring is normally done by an automatic instrumental analysis of the tape sections on which candidate events are recorded.

In the training sessions under review, the TTD was used as a supplement to the twin sensor device. Because it was used on this informal, irregular basis, formal data were not collected.

c. Training Sessions with Evaluation Device

Although the EDs did not function correctly when first received, they were used for about a week before being returned for modification, because it took a week for the problems to become clearly identified. They were then modified and returned to service on 18 September 1986. Counting all sessions, including those when the EDs were not functioning satisfactorily, some 30 training sessions were held using the EDs.

Because the EDs do not provide satisfactory audio feedback, especially at subthreshold levels, two feedback devices were configured (from previously constructed equipment) that provide click-rate feedback from the ED noise floor. The addition of this extra feedback channel was very much appreciated by participants, because they and the experimental team had experienced a great deal of frustration caused by the lack of feedback from the EDs, especially in the first phase of their usage when the feedback algorithm was based on peak detection.

Unfortunately, although some participants had reached the stage of just starting to function effectively with the MSD in the next room, the frustrations and generally negative effect caused by the EDs when they first arrived seriously affected the RA performance of all of the participants. The ability to create ostensible distant effects was seemingly lost by the individuals who had previously exhibited this capacity with the MSD. It is arguable that the RA performance of some participants has still not fully recovered from this setback. This incident must be regarded as an important lesson for the JFK research team. Instrumentation must be released for use with participants only after it has been proven fully functional and after the operators have received sufficient training.

Participants varied greatly in their response to the rather noisy printers functioning during the trial period, so the download capability of the Model 102 computers used as terminals proved to be a crucial facility for those participants who would otherwise have found the noise intolerable.

The ED systems have been used in three configurations: (1) the "Open" (O) condition, in which the front window is left open; (2) the "Closed" (C) condition, in which the front window is secured; and (3) the "Next Room" (NR) condition, in which the system was placed in a room adjacent to the participant.

The NR condition was dropped after it was found that the participants' RA performance had regressed as a result of the instabilities and frustrations of the early phase of ED usage, so that they could no longer produce effects in adjacent rooms. In the O condition, artifacts caused by acoustic events (principally speech) are readily recorded at low threshold settings (10). In the C condition, acoustic artifacts of above threshold magnitude are seldom produced by normal speech. Because many sessions were held in the O condition, and some sessions with other equipment were of necessity interleaved with the ED sessions, formal data are not available for the ED training sessions held at JFK. Some sessions were held under the C condition in which over-threshold (threshold of 10) events were obtained.

d. Criteria for Continuance of Training

Originally, the decision regarding the continuance of participant training after the three preliminary sessions was planned to be based on a formal and invariant criterion applied to the performance reached by participants in these sessions. However, the use of three different and essentially noncomparable training devices in the early training phases (unmodified screening device, modified screening device, and twenty-tone device), necessitated by the delay in the delivery of the evaluation devices made it impossible to apply a formal criterion.

The criterion used was that the participant's trainer had to be convinced that the participant had produced at least two events that were highly suggestive of Piezo-RA before further training. Because every participant met this criterion, all were retained.

Since that time, one participant (WE) has withdrawn because of the demands of his JFK courses, one participant (RS) will be dropped because of poor RA performance, one (HW) will be working in Argentina for three months, and two (SN and JA) may be dropped on account of poor RA performance, unless this improves within their next three RA sessions. SN, JA, and RM have all shown a powerful negative effect from the first phase of use of the evaluation devices, and RM and JA have made only a slow recovery. In this context, it is interesting that both RM and JA have been trained by Julian Isaacs, who was probably most directly affected by the effects of the nonfunctioning evaluation devices.

One of these less successful participants (JA) is currently undergoing remedial biofeedback training during his experimental sessions under the control of another experimenter (MM) in order to explore the possibility that those RA agents who perform poorly, apparently because of excessive striving, may be able to improve their RA performance after supplementary training at a biofeedback task.

e. **Overall Session Results**

Although no formal data are available from this phase of research, certain conclusions can informally be suggested. Table A-2 shows the number of sessions performed by each participant.

Referring to Table A-2, the basic postulate (that repeated trial sessions produces increments in performance for some participants) seems to be upheld by the results. Five of the 10 participants showed definite increases in Piezo-RA output per session (WA, CR, HW, ZK, and JM). These results are significantly better than the English results,[4] which suggested that perhaps only one in seven participants in training would show marked increases in RA performance with training (the English participants were also much less carefully selected). Of the five less successful participants, it seems that three may yet show a learning effect, although it seems likely that the other two will probably not.

Second, the results seem to suggest that session number is an important determinant of performance. Referring to Table A-2, it can be seen that the successful group of five performed a total of 94 sessions, whereas the less successful group of five performed 58 sessions--only just over half of the successful group's sessions. Although this difference in performance with increasing number of sessions may partly reflect motivational factors as well as learning, it certainly appears to be an important variable, whatever interpretation is given to it.

Experimenter	Participant	Number of Sessions
R.C.	W.A.	20
R.C.	C.R.	14
J.I.	R.M.	9
J.I.	J.A.	11
J.J.	H.W.	15
J.J.	R.S.	16
D.M.	Z.K.	26
D.M.	S.N.	7 (+5)**
J.M.	W.E.	10
M.M.	J.M.	7 (+12)*

* Estimated sessions conducted prior to Remote Action Project
** Previous sessions run by M.M. and J.J.

TABLE A-2 PARTICIPANT PIEZO-RA TRAINING SESSIONS

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IV INSTRUMENTAL DESIGN

a. Psychological Requirements

The specifications for the functional design of the SD and the ED were outlined in detail in the description of the devices' functional designs, which has already been tendered to SRI.

Because the psychological requirements of the training instrumentation are crucial to the Piezo-RA training process, a recent paper by this author[5] is quoted here; these paragraphs specify some centrally important considerations relating to the feedback properties that are necessary for RA learning.

> "...The phenomenology of DDPK training appears closely to conform to the principles of operant conditioning where a behavior which is an approximation to the required behavior must be emitted first, and then reinforced, before further, more optimal behaviors, are then emitted and can be reinforced. In practice this leads to what at first sight appears to be a paradox, that subjects should essentially be presented with a "noisy" system, but the rationale for this relates closely, in my view, to the reason why it seems relatively easy to obtain PK on REG types of systems.
>
> If we ask the question of what behaviors should be reinforced in order to start the process of operant conditioning in the PK training process, clearly the answer must be PK behaviors, or at least PK-like behaviors. Typically, a DDPK agent may at first produce only relatively few PK events, or even none, over the threshold which defines events as candidate DDPK (in practice the threshold is set high enough for some under-threshold events to be likely to be PK rather than noise or artifact[4]). But if feedback is only supplied for the over-threshold events, the operant conditioning process will be very slow and a risk is generated that due to lack of frequency of reinforcement, motivation may fail and the PK response may even be extinguished. It thus becomes necessary to provide a feedback signal which is sufficiently sensitive to the state of the system to be able to relay the intrinsic noise of the system in perceptible form to the DDPK agent in training. This will ensure that however slight the trainee's PK responses may be, reinforcement will occur.
>
> Usually, what happens in DDPK training is that the agent's signals start out by mostly being in the range of the noise of the system, but over the course of several DDPK training sessions [typically six sessions in the English studies[2 4] with

successful subjects, the signal magnitudes climb out of the noise until many over-threshold events occur in each session. This kind of phenomenology is very compatible with the operant conditioning paradigm, and the crucial point to appreciate, from that perspective, is that in order for the subject to emit a PK-like behavior, the feedback system must be sensitive enough to be able to signal perturbations which are at, or very near, the intrinsic noise level of the DDPK detection system.

The psychology of DDPK training can be examined at different levels of discourse, using different models, since there are other non-paranormal learning models which can be applied as analogues to DDPK training in addition to operant conditioning. So far, I have used the language of operant conditioning, but a more cognitive approach is possible. K.J. Batcheldor's formulation falls into this category.[6] His principle hypothesis is that PK is elicited by a particular type of situationally triggered "instant" belief state which is induced by the subject being exposed to a stimulus which they interpret as indicating that PK is already occurring. This is the rationale for Batcheldor's "artifact induction (of PK) hypothesis." ...From this cognitive perspective, relaying the noise from a DDPK detection system allows the PK trainee to construe (or misconstrue) the system's fluctuations as being due to his or her influence, analogously to the situation I have hypothesized as occurring with the REG. This then may create the "instant" PK-producing belief state, which creates more reinforcing feedback, and so on. Diana Robinson has discussed the possibly psi facilitating role that a subject's felt sense of control could have in maintaining high levels of motivation in the absence of high anxiety or high striving.[7] In support of this analysis, it should be mentioned that an apparently universal preference shown by DDPK trainees is that they must, through experience of the feedback signal, feel "in touch" with the piezo crystal itself, which is interpretable as implying that the feedback system should be responsive to the slightest alteration in state of the piezo sensor.

...In terms of DDPK methodology the lessons from this analysis seem clear--the feedback system must be capable of wide excursions from the instrumental "noise floor" up to several magnitudes above noise-- yet still provide sensorally descriminable and aesthetically pleasing results. Presumably too, for motivational optimization, the feedback modality should fit the preferences and cognitive style of the PK trainee, although this too remains unverified by experimentation."

The current ED instrumentation does not yet fulfill these requirements, because its "white noise" audio output does not seem to be aesthetically acceptable to participants, nor does it provide accurate and fast information regarding the occurrence or magnitude of under-threshold RA events. This deficiency was ameliorated in both the SRI-based sessions and the JFK ED training sessions by the use of supplementary audio feedback from devices (one was loaned to SRI) modified for this purpose.

Additionally, it is clear, comparing the ED with an analog audio feedback system, that the response time of the ED is presently too slow to allow its audio feedback to accurately track complex incoming RA signals. Psychologically, participants are faced with a device that fails to provide essential and motivating feedback at the low end of the RA range and that does not give a smooth and well-graded response to RA effects. These properties are crucial in a device intended for training purposes.

b. Recommended Evaluation Device Modifications

JFK recommends the following modifications to the ED produced by SRI:

(1) Software

(a) If software modification can increase the speed of response of the feedback, this would be useful. It may be that no significant increase in feedback response speed can be achieved by software modifications, given that the STD system uses an interpreted BASIC. In this case, substitution of an analog feedback system driven by the chart recorder output would definitely correct the problem.

(b) All data, especially the system status check information, should be displayed by the terminal. At present the system check data is only output via the serial printer port.

(c) The printer output becomes unreadable under conditions of RA activity because the print becomes displaced from its normal position and overprinting occurs. Perhaps buffering of printer output might correct this without incurring a significant overhead.

(d) The "white noise" feedback is very unpleasant to listen to because it has a "pumped" quality, in which increases in volume occur as discrete steps, happening at irregular intervals (because of program execution time variations due to competing tasks for the CPU). Finer gradation of volume increases, or an analog feedback system, is necessary to remove this characteristic.

(e) The white noise also still contains 60-Hz components. Substitution of a true white noise source and the careful sculpting of its amplitude/frequency characteristics would correct the problem of the subjective acceptability of the white noise.

(f) At present, only three trial periods per session are allowed by the system if automatic timing of sessions is required. It was originally requested that up to six trial and six rest periods be software selectable per session. At present, the printout does not seem to consistently label printed-out events as "R" or "T."

(g) The software clock providing the automatic timing is clearly inaccurate, even over short periods. Substitution of hardware clock would correct this.

(h) The "beep" must go! The automatic timer beep is annoying to participants and experimenters.

(i) The date should be input as a normal date, not as a Julian date.

(j) The system should be restartable under software control. Having to switch it off and on to reset it probably shortens the system's life.

(k) As a substitute for the beep, it would be helpful to have an onscreen display of available time left per trial or rest period. This display could be updated at minute intervals and left onscreen until the next update.

(l) Documentation for the system outlining the generic operating system commands would be helpful.

(m) A facility allowing comments to be input to the data set generated during the session, in an online mode, would also be helpful, because the system is not automatically self-validating, necessitating the commentary of a human witness to assure that the events are not due to fraud or artifact.

(2) Hardware

(a) As recommended in (a) of the preceding "Software" section, provision of analog feedback (certainly at sub-threshold levels) would greatly improve the system's feedback characteristics for RA training purposes.

(b) Longer optical fiber links are needed to enable the ED systems to be located at longer distances from the participants.

(c) A cooperative JFK/SRI attempt to improve the isolation of the ED would be of great benefit. Construction of a multilayer vibration-resistant mounting would be helpful. It would also be possible to construct a sound-attenuating shield in which to enclose the ED.

(d) The JFK group is considering the possibility of locating the ED target systems in nonadjacent rooms--locations where a "buffer" room is interposed between participants and the target systems. This should reduce problems of artifact to vanishing point.

(e) An extension of Item (c) above would be to attempt long-distance RA training, using telephone lines to convey the feedback from the ED system to the remote participants. This would require inclusion of telephone equipment and expenses as part of the budget.

c. Screening Device Characteristics

The SD seems to be successful in its application environment. The noisiness of the strain gauge front end remains a problem, because it creates a zone of uncertainty in interpreting the scores obtained with its use. However, it well fulfills the important requirements of robustness, portability, and ease of use. Psychologically, the SD seems to be well accepted.

V CONCLUSIONS AND SUGGESTIONS

Several tentative conclusions seem to emerge from consideration of the period under review. The mass screening technique does seem to work in the United States and can be adapted for use by a screening team, rather than an individual screener. The student population of JFK appears to show some considerable potential as a source of "psychic" profile individuals, some of whom may be suitable for Piezo-RA training. There also appear to be several individuals, at least, who live near enough to SRI to consider as experimental participants (who were identified as possible RA trainees by the Trellis screening).

The Piezo-RA training technique also seems to function effectively in the United States, and the preliminary informal results look very promising, with the American RA trainees showing a response to training that is superior to the English RA trainee group. The techniques for RA training also seem successfully transferable to other individuals, and there seems good reason to expect that Scott Hubbard, for example, would easily be able to learn the RA training technique. The preliminary data indicate that performance is dependent upon the number of training sessions performed. The relevance of the elite PIF "PB" profile to good RA performance has not yet been clearly demonstrated, but the results so far certainly do not appear to contradict the use of this profile as one of a number of factors to be weighed in selecting possible RA trainees. Changes in training conditions that disrupt the participants' environment have been shown, at least informally, to be detrimental to RA learning. The crucial importance of appropriate feedback from RA detection instrumentation also is indicated by the results.

For formal studies, it seems essential that the Piezo-RA agents be trained to the point where they become capable of affecting instrumentation that is distant from them. Because some participants prefer to make noise while producing ostensible Piezo-RA effects, good isolation (by distance and shielding) of Piezo-RA detection systems from environmental noise and vibration seems essential.

The development of methods of improving the efficiency of participant selection certainly seems worth investigating. The present PIF represents a first attempt to develop one element of this approach. The further development of participant profiling might well prove fruitful. Equally, there may well be remedial or facilitating techniques that could improve the learning performance of Piezo-RA trainees, and these would be worth investigating also. An examination of the effects of feedback system characteristics and RA psychological induction strategies might also lead to the development of superior feedback and RA elicitation techniques that might improve RA performance. Of special interest would be the application of behavioral therapy techniques (used for ameliorating phobic behavior) for reducing RA task anxiety and inhibition due to formal, witnessed, or novel conditions. The characterization of RA production states seems an important goal. Electrophysiological studies of RA agents when producing effects could be very useful, because if characteristic states correlated with RA production, biofeedback devices could then be produced to train individuals to achieve the requisite states.

Finally, the major challenge faced in the upcoming cycle's activities is to retain the drive and motivation of the participants and the experimental team. This will require careful goal-setting and the provision of carefully graded, but successively more challenging Piezo-RA tasks for participants, which is consistent with the overall aim of achieving increasingly high-quality evidence of the existence of the Piezo-RA effect.

REFERENCES

1. SRI International, Services Contract No. C-11488.
2. Issacs, J., "A Mass Screening Technique For Locating Pkmb Agents," *Psychoenergetic Systems,* 4, pp. 125-158 (1981).
3. Houck, G., "pk Party Format And Materials Required," Unpublished Monograph, New Port Beach (1982).
4. Isaacs, J., "Some Aspects Of Performance At A Psychokinetic Task," Unpublished Ph.D. Dissertation, University Of Aston, Birmingham, England (1984).
5. Isaacs, J., "Directly Detectable Psychokinetic Effects: A New Category Of Psychokinesis," Paper Presented At The 1986 Parapsychological Foundation Conference ("Parapsychology And Human Nature"), In Press.
6. Batcheldor, K. J., "Contributions To The Theory Of Pk Induction From Sitter-group Work," *Journal Of The American Society For Psychical Research,* 78, 2, pp. 105-122 (1984).
7. Robinson, D., "Motivation In Parapsychology: Competence, Control, And The Choice Effect," *Journal Of Parapsychology,* 45, 3, pp. 215-232 (1981).

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Annex 1

THE PARTICIPANT INFORMATION FORM

Approved For Release 2001/03/07 : CIA-RDP96-00789R002200100001-6

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JOHN F. KENNEDY UNIVERSITY: GRADUATE SCHOOL OF CONSCIOUSNESS STUDIES
REMOTE ACTION PROJECT: PARTICIPANT INFORMATION

Thank you very much for aiding our study ! Please answer all the questions on the top half of this page and on the other pages now. Your answers are strictly voluntary and will be kept confidential - no information you have given will be released without your written permission. If you have any questions, please feel free to ask.

Name ______________________ Date ______________

Address ______________________

____

Phone Number(s) ______________________

31. If you are unsure whether to answer the question below "yes", please answer this question after you have heard the presentation, and participated in the remote action session. Please don't forget to answer.

May we have your permission to contact you regarding participation in the Remote Action Project or other parapsychology studies at John F. Kennedy University? ___ YES ___ NO

Please indicate your Availability ______________________

NOW TURN OVER THE PAGE AND PLEASE CONTINUE TO ANSWER THE QUESTIONS

ANSWER THIS SECTION AFTER THE METAL-BENDING AND REMOTE ACTION SESSIONS

Please check the appropriate answers.

	NO	YES
Did you bend any cutlery ?	___	___

If yes, how much physical force did you have to use to make it bend ?

Great ___ Moderate ___ Little ___ None ___

Did you experience any of the following while bending ?
Metal getting hot ? ___ Suddeness of bend ? ___ Metal going soft ? ___
Feelings of bodily heat ? ___ Tingling in hands or body ? ___
Was your attention on the metal when it happened ? On ___ Off ___
What was your mental state when the bending occurred ?
Laughing ? ___ Distracted ? ___ Concentrating ? ___ Other ______________

------------------TO BE FILLED OUT BY THE EXPERIMENTER------------------

Screening: _____ Screener: ____________ Referral/Other: ______________

Machine No. _____ Macro Events ______________________

Machine Results ______________________

Intuitive Hit/Impressions:

HAVE YOU EVER EXPERIENCED ANY OF THE FOLLOWING PHENOMENA ?

If "NO", place a check mark on the line under "no":

If "YES", please circle how often:

1 equals 'once',
2 equals 'more than once, several times', or
3 equals 'often, frequently'.

	NO	YES
1. Have you ever tried to do anything physical with the power of your mind?	____	1 2 3
2. Have you ever had raps, bangs, footsteps, or other unusual noises occur ?	____	1 2 3
3. Have you had doors or windows open or close, or lights turn on or off without physical cause ?	____	1 2 3
4. Have you ever had objects disappear or appear in new places when you were certain of their location or have you ever felt that they moved without physical cause?	____	1 2 3
5. Does normally functioning equipment occasionally fail to operate for you or does malfunctioning equipment work unexpectedly for you ?	____	1 2 3
6. Have clocks or watches stopped or changed speed, or have metal objects bent without physical force in your presence ?	____	1 2 3
7. Have you ever felt that you had received information about a person or event from touching an object ?	____	1 2 3
8. Have you ever had an unusual strength experience ?	____	1 2 3
9. Have you ever had any of the following experiences while awake: The feeling or thought that an unexpected event a) had happened, b) was happening, or c) was going to happen - and later learned that you were right ?	____	1 2 3
10. Have you ever felt that you received information about something which happened before, during, or after a dream which you did not know about or did not expect at the time of the dream ? (veridical dream, symbolic dream)	____	1 2 3
11. Have you ever had an experience while awake in which you felt you were located outside of or away from your physical body ?	____	1 2 3
12. Have you ever felt you have seen a location or event at a distance ?	____	1 2 3
13. Have you ever had, while awake, a vivid impression of seeing or being touched by another being, or a sensation of cold, which you felt was not due to any external physical or natural cause ?	____	1 2 3

14. Have you ever practiced or felt that you have benefitted from spiritual or psychic healing ? ____ 1 2 3

15. Have you had an experience when you were thought to be dead and them came back to life, and had memories of experiences such as voices, light, other beings ? ____ 1 2 3

16. Have you ever experienced unusual ectasy,"oneness with nature", or the phenomenon of "unity" ? ____ 1 2 3

17. Have you had any other unusual experiences you feel might be of interest to us ? Please briefly mention the type:

____

____

Please circle the numbers on the scale, from 1 equals 'Definitely No' to 5 equals 'Definitely Yes', that best represents your answers to the two questions:

	Definitely No				Definitely Yes
18. Do you think its possible to affect physical objects without touching them ?	1	2	3	4	5
19. Do you think that you can affect physical objects without touching them?	1	2	3	4	5

20. Please check the mental techniques which you have used, if any:

____ affirmations ____ concentration ____ meditation ____ biofeedback

____ relaxation ____ visualization ____ hypnosis or self-hypnosis

____ yoga ____ bodywork therapy ____ psychotherapy or counseling

Other ____

____

21. In what sport, dance, or martial art do you actively participate, if any:

____

22. To which religion do you feel closest? ____________________

23. Date of Birth (Month, Day, Year) ____________________ 24. Sex ___M ___F

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Annex 2

THE JFK COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS

The JFK Committee for the Protection of Human Subjects (CPHS) was created during the period under review so that the university will have an internal review board (IRB) that conforms to the DHHS requirements for IRBs. It has held two meetings to date and approved the research described in this report at its second meeting. The membership of the committee reflects a wide range of JFK faculty and local representatives. Continuing liaison has been maintained with Marvin Ziegler, the CPHS chairman.

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