A new technique for screening suspected guerrilla fighters.

THE METAL TRACES TEST

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To the many new techniques we have had to develop in adapting to the peculiarities of counterinsurgent action there has now been added a sophisticated yet simple procedure that can help pick out the active guerrilla from the general population into which he melts. In a more or less homogeneous population the activist insurgents, the apathetic, and the loyal all appear as alike as peas in a pod and usually cannot be distinguished without their perpetration of some overt act. The ubiquity of the guerrilla, his discipline and adherence to the principles of secrecy, and his coercive tactics, as well as his chameleon-like adaptation to his environment, add to the difficulty of identifying him. In past so-called search-and-clear operations into guerrilla areas the process of sorting and screening large numbers of the rural population to detect activists has been less than effective. Definitive biographical information is usually lacking, and frequently a lack of staying power in the area limits the time available for interrogations.

Pondering this problem, the CIA Vietnamese Affairs Staff, although it recognized that there is no substitute for the time-proven investigative methods that depend on interrogation and collateral biographic data, nevertheless thought that it might be possible to find some new technique to supplement these and provide material assistance at the operational level. It looked to the armed guerrilla, the man with a gun, as both the most dangerous and potentially the most easily distinguishable. It issued a requirement for a review of all personnel discrimination systems used by police and law-enforcement agencies in the hope that one or more of these might be modified for use in an operational environment as in Vietnam.

First Explorations

Among the techniques examined in this review was a paraffin test for nitrite residue left on the skin from the discharge of a firearm. It seemed that a modification of this test for nitrites might identify a guerrilla who had fired a weapon. After some testing of the method in the United States, a small team was dispatched to Vietnam in September 1965 to test it in the practical environment. The test was administered to unwitting Vietnamese subjects under the light cover of a medical examination. The overseas results, however, showed an exceedingly low percentage of test positives among subjects known to have fired weapons, and it was soon evident that this approach would have to be abandoned.

Meanwhile a portion of the cover medical examination had by chance turned up a technique which seemed to have greater promise than the modified paraffin test. During the course of this examination a medical officer examined with an otoscope the ears of weapon-firing subjects, and in his opinion some of them showed evidence of disturbed or dislocated cerumen (ear wax). This officer, however, had had considerable training in examining children's ears beyond that usually obtained in general medical practice and was therefore much more sensitive to such changes than a medical technician or corpsman would be. It was decided the technique should not be pursued because it called for skills not readily available.

When the test team returned from the field with these negative results, it was resolved to make a new and more systematic start. A physician was put in charge of the project; he insisted, rightly, that no technique, however promising, would be used operationally until all environmental and preliminary testing had been finished and the results showed an unquestionable high percentage of accuracy.

A considerable variety of possible techniques were picked for an initial trial and elimination contest in order to separate out the avenues most promising for further study from those clearly nonproductive. The list included, among others: chemical examination of auditory canal debris and of wipings from the forward quarter-inch of each nostril; chemical tests for metallic ions on palmar surfaces; tests for the presence of antimony, barium, lead, and potassium; visual examination of the tympanic membranes for variations in appearance before and after firing; blood tests for detectable levels of carbon monoxide present from the usual 50% CO gas in the dis-

charge; and, finally, measurement of shoulder tissue temperatures before and after firing. The testing of these methods, undertaken at a domestic field training center, was completed by mid-October 1965.

Metal Traces Emerge

On the basis of data obtained in this trial heat, most of the techniques were discarded as not worthy of additional development; but a surprisingly gratifying result was obtained from the test for metal traces on the hands of weapon-handlers. This approach was especially attractive for its potential in ultimate application because it did not require that the weapon be fired, merely handled. The initial results indicated that the deposit of metal traces from handling metal objects could be detected in 80% or more cases.

Additional testing was authorized, and a test program was designed to refine and amplify these initial results and establish base data for further exploratory, control, and environmental testing. The first step toward establishing this method as a useful technique was to determine just where on a person's body or clothing, as well as palms, metallic ions were likely to be transferred while firing or handling a weapon. To answer this question visually, the metallic portions of typical insurgent weapons were coated with lampblack and the weapons were fired and handled for various periods of time under simulated field conditions. The handlers, on whom the areas of contact were clearly apparent, were then photographed and the data recorded. This photographic record became the base line for further testing.

With these weapon "fingerprints" in lampblack the test team was able to determine in what patterns and where on the hands and body metallic traces should be detectable under what conditions. The patterns formed by different weapons in the test indicated that differentiation among weapon types might also be possible. This was a bonus effect which, if it proved reliable, could lead to more definitive investigation and segregation of subjects. Contact with non-weapon metal items common in the insurgent environment could also, it seemed, be sorted out to make the personnel screening more valid and indicative.

The coating tests were repeated, substituting for the lampblack an invisible marking material which became visible in the presence of ultraviolet light; the results corroborated those with lampblack. Then testing was done to determine whether the metallic traces themselves formed patterns similar to those of the preceding exercises. In order

to make the traces visible a chelating reagent—which captures metal ions in the way that hemoglobin captures oxygen—was suspended in alcohol and sprayed on the hands and clothing of the subject from an aerosol bottle. After the solution dried, the hands and clothing were viewed under ultraviolet lamps in reduced visible light. The results were strikingly similar to those produced by the previous coating tests.

At this time the tests were still designed to compare patterns from known weapons. All of the subjects handled weapons and the results were compared with the patterns recorded by photography. Although their consistency was encouraging, there was still a question what would happen when the investigators were pitted against subjects who had handled weapons interspersed among others who had not. The next series of tests answered this question: their ability to distinguish readily between handlers and nonhandlers became evident. This was then the turning point in the development of the technique. The next step to advance its development was suitable environmental testing.

Development and Refinement

The new technique, however well vindicated by these tests, had to be proven in atmospheric and geographic conditions similar to those in a tropical insurgency environment. Panama was selected as an ideal such environment. Heat, humidity, and foliage conditions in that area, along with a U.S. military population in the form of the 8th Special Forces Group, simulated well the Vietnam theater. Arrangements were made for the use of facilities in Panama and of members of the 8th Special Forces Group as subjects. The six-member test team arrived in Panama at the beginning of February 1966 and established itself at Fort Sherman in the Canal Zone.

It was agreed that our subjects would be put through a tactical exercise in conjunction with the testing, furthering their Special Forces training as well as the interests of the test team. It was arranged that some participants would not be armed; the rest would have a wide range of weapons standard to the Special Forces and also common among Southeast Asian insurgents. Half the group was instructed to wear heavy cotton work gloves. The test team was not told which ones were the weapon handlers or the glove wearers.

When the subjects returned from the 24-hour field exercise they were divested of their weapons and gloves before being seen by the

examiners. At the test site their hands were sprayed with the alcohol suspension of chelating reagent and examined under the ultraviolet light. Examinations were conducted independently by two members of the team. In selected cases clothing was also sprayed and examined, as well as the gloves of unidentified subjects.

During this examination the Special Forces commanding officer, an extremely skeptical man by nature, thought he had found a way to beat the test. Approaching with an aide, he asked that his own hands be tested. The examiner, after spraying both him and his aide, was able to tell him he had handled two weapons—his own sidearms and his aide's M-3. He was sufficiently impressed that he asked the test team to report any difficulties they might have directly to him rather than go through channels.

After all the results had been gathered and tabulated they were compared with the control data kept by the military project officer. The test team had identified 136 out of 160 weapon handlers and 92 out of 124 nonhandlers, a total of 228 correct identifications in 284. In several cases it was able to determine the type of weapon carried. (In one case, when 60-mm mortar traces showed up on a man who had not carried one, he remembered later that he had momentarily picked one up when his buddy, carrying it, had fallen down.) Even when gloves had been worn, enough metal particles had usually been transferred through them by sweat and contact onto the hands.

Now it was time to engineer a field kit, devise an operational procedure, and produce a techniques manual. A heavily illustrated manual was decided on in order to reduce text requirements and cut to a minimum the time required to teach an operator how to use the kit. Exemplars of U.S., Soviet, and French weapons were assembled for a final series of tests at the domestic training center, in the course of which a comprehensive photographic sequence of weapon trace patterns could be established for the manual.

In these tests the subjects handled different weapons over varying periods of time, to create a photographic record of graduations in the density of hand patterns with increasing periods of contact. Other subjects were given a variety of metallic implements common in the operational environment, and the patterns made by these proved readily distinguishable, both in shape and intensity, from those of weapons. Also recorded was the intensification of the findings by perspiration—with some discomfort to the subjects, being exercised

with weapons in a gymnasium where both temperature and humidity had been raised by steam to nearly 90 when it was about 20° outside—by weight or circumference of the weapon, and by alloys in the metal.

In Field Operation

As the manual was being finished the CIA stations concerned were informed and elements of the Joint Chiefs of Staff were briefed. The Chairman of the Joint Chiefs decided on the spot that the process should be introduced in the Military Assistance Command Vietnam. A MACV officer was assigned to work with the project officer of the CIA Saigon Station. In preparation for training field operators, various instructional materials were reduced to 35 mm. slides and Vu-graphs. The Trace Metal Detection Kit Manuals, fresh from the printer, were pouched to the Saigon Station. Separately, 106 short-wavelength ultraviolet mineral lights, extra batteries, and battery chargers were shipped, and 3,000 eight-ounce plastic spray bottles of the chelating chemical in alcohol suspension. Each refillable bottle, costing but 18¢, contains enough fluid to treat liberally the hands of twenty to twenty-five subjects. The whole kit costs about $85.

A team of three, with medical, technical, and Vietnam specialties respectively, were sent to Saigon in late April 1966 to introduce the kits and the technique. First they demonstrated the kits and gave briefings to the principal Station officers and numerous MACV J-2 branch and division chiefs. Then they began briefing CIA operating personnel whenever and wherever they could be reached, issuing kits at the same time: after his briefing a field case officer would return kit in hand to his provincial location.

Nineteen kits were left with U.S. military field elements for tests and evaluation, the results of which would determine MACV requirements for additional units. In order to insure proper use of these in the field, the three-man team traveled extensively to field locations to brief U.S. military units on site. In one case, during Operation Birmingham, the Big Red One commander, reconnoitering in his helicopter, had spotted two men working in a rice field and picked them up as his personal prisoners. He brought them in to his command post just after a Prisoner Exploitation Team had been briefed there and asked that they be tested. The spraying so scared one of them that he wet his pants and confessed even before the examination confirmed his guilt. In another case three women who had been seen walking along a road that was frequently mined were

brought in and tested. When they themselves saw that the hands of one looked different in the ultraviolet light, the other two turned on her and accused her.

Results

After this introduction the CIA Station asked for 100 more kits and the U.S. military for 442. Requested to report the results of their use for a limited time, Saigon furnished the following figures for the period 5 May to 1 August 1966: 1,186 persons tested by short-order trainees; of these, 628 positive; of these, 223 proven Viet Cong, many by confession.

The application of the Trace Metal Detection Kit is not limited to counterinsurgency. Law enforcement agencies, including several major metropolitan police departments, are interested in it as a crime lab tool. It can be so used to advantage even though its results cannot serve as legal evidence in court until it has been qualified by a large body of unclassified evidential data.