

Mr. EISENBERG. Yes. There will be testimony elicited at another time on those examinations, Mr. Frazier.

Mr. McCLOY. Mr. Frazier will be a witness in those, too?

Mr. EISENBERG. Yes, sir.

Mr. Specter will probably elicit that testimony.

Mr. Chairman, or gentlemen, are there any other questions?

Thank you very much, Mr. Frazier.

Mr. FRAZIER. Excuse me. I have one photograph here that might be useful in this regard, and that is of a clip showing the six cartridges loaded into it.

Mr. McCLOY. I think that might be a good idea. You might identify that, to show what we mean by clips.

Mr. EISENBERG. You have shown us photographs of a clip—the clip from the Exhibit 139 rifle?

Mr. FRAZIER. Yes, sir.

Mr. EISENBERG. One photograph loaded, and one unloaded?

Mr. FRAZIER. Yes. In one instance I put six cartridges in the clip and photographed it.

Mr. EISENBERG. Did you take those photographs?

Mr. FRAZIER. Yes, sir.

Mr. McCLOY. Mr. Frazier, you testified that if you didn't use the clip you would only be able to shoot one shell at a time, is that right?

Mr. FRAZIER. Yes, sir; this weapon does not have the box magazine commonly found in most military weapons which holds the cartridges and can be reloaded one at a time, but they must remain in the clip, or they will malfunction. The follower in the weapon will throw the cartridges right back out of the gun.

Mr. McCLOY. That explains it to my mind, because I know I have fired rifles with clips and fired them without clips. But they were much more convenient in loading.

Mr. FRAZIER. Yes, sir; this one is designed—

Mr. McCLOY. For example, the Springfield you could load with clip or load without a clip.

Mr. FRAZIER. Yes, sir.

Mr. McCLOY. But this one has to have a clip in order not to malfunction?

Mr. FRAZIER. Yes, it does.

Mr. EISENBERG. Those will be 574 and 575.

Mr. McCLOY. They may be admitted.

(The photographs referred to were marked Commission Exhibits Nos. 574 and 575, and received in evidence.)

Mr. McCLOY. Thank you very much, Mr. Frazier. You have been very helpful.

TESTIMONY OF RONALD SIMMONS

Mr. EISENBERG. Our next witness will be Mr. Simmons.

Mr. McCLOY. Would you hold up your right hand?

Do you solemnly swear that the testimony you will give in this hearing will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. SIMMONS. I do.

Mr. McCLOY. Please be seated.

This, as you know—the constitution of the Commission and its purpose—we want to ask you something about the firearm aspect of our hearings, and certain characteristics of this rifle that we would like to hear from you about, and if there is anything else you have that can throw light on our problems.

If you can state for the record, first, your name, and where you live.

Mr. SIMMONS. My name is Ronald Simmons. I live near Havre de Grace, Md.

Mr. McCLOY. Mr. Eisenberg?

Mr. EISENBERG. Can you give us your position, Mr. Simmons?

Mr. SIMMONS. I am the Chief of the Infantry Weapons Evaluation Branch of the Ballistics Research Laboratory of the Department of the Army.

Mr. EISENBERG. And how long have you held this position?

Mr. SIMMONS. This position, about four years, and previous employment has been in these laboratories.

Mr. EISENBERG. How long have you been working, Mr. Simmons, in the area of evaluation of weapons?

Mr. SIMMONS. Since 1951, in various classes of weapons.

Since 1957, however, I have had the responsibility for the laboratories on small arms.

Mr. EISENBERG. Has part of it—of these—have part of these evaluations been conducted with military rifles, Mr. Simmons?

Mr. SIMMONS. Most of our evaluations have been associated with military rifles.

Mr. EISENBERG. How long altogether have you spent in this area?

Mr. SIMMONS. In the area of rifles?

Mr. EISENBERG. Yes.

Mr. SIMMONS. Some experience beginning from about 1953. I have been continuously concerned with this since 1957.

Mr. EISENBERG. Can you give a rough estimate of how many weapons you have evaluated as to accuracy?

Mr. SIMMONS. No. We have been concerned with almost all of the weapons which the Army has tested, either in preliminary stages or as developmental weapons.

Mr. EISENBERG. But your specialty is the evaluation of weapons systems, including military rifles, and you have been engaged in this for 13 years, as to all weapons systems, and since 1953 as to—

Mr. SIMMONS. Yes, that is correct.

Mr. McCLOY. In the course of that you have examined hundreds of rifles, though, have you not?

Mr. SIMMONS. Well, our examination of rifles is not the detailed engineering, design experiment which a gunsmith or a rifle expert as such would concern himself with. We are more concerned with establishing a framework by which we can put numbers to the performance of military rifles in tactical employment. And this means that for a specific—specific classes of weapons, we have had to establish, for example, round-to-round dispersion, the accuracy with which they can be employed, and the wounding power of the projectiles.

Mr. McCLOY. In the course of this you have fired a great many rifles yourself?

Mr. SIMMONS. No, sir; I don't fire them.

Mr. McCLOY. Somebody else fires them?

Mr. SIMMONS. Yes.

Mr. McCLOY. But you make the studies in relation to the accuracy of the weapons?

Mr. SIMMONS. Yes, that is correct. The firing is accomplished by employees of the development and proof services, which is the weapons testing facility at the Aberdeen Proving Ground.

Mr. McCLOY. Your task is primarily evaluation—

Mr. SIMMONS. Yes, sir.

Mr. McCLOY. Of the characteristics of the rifle, particularly in terms of its accuracy and its wounding power, killing power?

Mr. SIMMONS. Yes, sir.

Mr. EISENBERG. Mr. Chairman, may this witness be admitted as an expert to testify in this area?

Mr. McCLOY. Yes.

Mr. EISENBERG. Mr. Simmons, did you conduct a test from a machine rest, a test of round-to-round dispersion of this weapon, or have such tests conducted?

Mr. SIMMONS. May I check the serial number?

Mr. EISENBERG. I should ask first if you are familiar with this weapon.

I have handed the witness Commission Exhibit 139.

Mr. SIMMONS. Yes. We fired this weapon from a machine rest for round-to-round dispersion. We fired exactly 20 rounds in this test, and the dispersion which we measured is of conventional magnitude, about the same that we get with our present military rifles, and the standard deviation of dispersion is .29 mil.

Mr. EISENBERG. That is a fraction of a degree?

Mr. SIMMONS. A mil is an angular measurement. There are 17.7 mils to a degree.

Mr. EISENBERG. Do I understand your testimony to be that this rifle is as accurate as the current American military rifles?

Mr. SIMMONS. Yes. As far as we can determine from bench-rest firing.

Mr. EISENBERG. Would you consider that to be a high degree of accuracy?

Mr. SIMMONS. Yes, the weapon is quite accurate. For most small arms, we discover that the round-to-round dispersion is of the order of three-tenths of a mil. We have run into some unusual ones, however, which give us higher values, but very few which give us smaller values, except in selected lots of ammunition.

Mr. McCLOY. You are talking about the present military rifle—will you designate it?

Mr. SIMMONS. The M-14.

Mr. McCLOY. Is it as accurate as the Springfield 1906 ammunition?

Mr. SIMMONS. I am not familiar with the difference between the M-14 in its accuracy and the 1906 Springfield. These are very similar in their dispersion.

Mr. McCLOY. At a hundred yards, what does that amount to? What is the dispersion?

Mr. SIMMONS. Well, at a hundred yards, one mil is 3.6 inches, and 0.3 of that is a little more than an inch.

Mr. EISENBERG. You tested this with what type of ammunition, Mr. Simmons?

Mr. SIMMONS. The ammunition was labeled Type Ball, and it was made by the Western Cartridge Co., Division of Olin Industries.

Mr. EISENBERG. Was that a 6.5 mm.?

Mr. SIMMONS. 6.5-mm. Mannlicher-Carcano.

Mr. EISENBERG. In the course of this test from a machine rest, Mr. Simmons, did you also attempt to determine the muzzle velocity?

Mr. SIMMONS. Yes; we also measured muzzle velocities for approximately 10 rounds of the ammunition. We gather from these measurements that the nominal velocity, the nominal muzzle velocity is of the order of 2,200 feet per second, and the velocity at about 200 feet from the muzzle is approximately 2,000 feet per second. And there is some variation in velocity from round to round as there is with all small-arms ammunition. But the variation is relatively small, and within the same order of magnitude as for conventional ammunition.

Mr. EISENBERG. Did you test the bullets for yaw?

Mr. SIMMONS. Yes; we measured yaw also, and all measurements of yaw were also small. We had no values in excess of 2 degrees, and many values were less than 1 degree in yaw, indicating that the round is quite stable.

Mr. EISENBERG. How did you test for yaw?

Mr. SIMMONS. We took spark shadowgraph pictures at various stations down range from the muzzle, so that we actually have pictures of the position of the bullet relative to the top and bottom of our range.

Mr. EISENBERG. Did you bring those pictures with you?

Mr. SIMMONS. No; I do not have them with me.

Mr. EISENBERG. Could you furnish those to the Commission at a later date?

Mr. SIMMONS. They could be made available later. I would like to point out these are not pictures, however. They are on large pieces of glass, and they are not photos.

Mr. EISENBERG. Can they be read by a layman?

Mr. SIMMONS. That I do not know. I do not read them.

Mr. EISENBERG. Well, I wonder whether you can send them up, and we could take a look at them.

Mr. SIMMONS. Yes; we can have them forwarded.

Mr. EISENBERG. Was it reported to you by the persons who ran the machine-rest tests whether they had any difficulties with sighting the weapon in?

Mr. SIMMONS. Well, they could not sight the weapon in using the telescope, and no attempt was made to sight it in using the iron sight. We did adjust the telescopic sight by the addition of two shims, one which tended to adjust the azimuth, and one which adjusted an elevation. The azimuth correction could have been made without the addition of the shim, but it would have meant that we would have used all of the adjustment possible, and the shim was a more

convenient means—not more convenient, but a more permanent means of correction.

Mr. EISENBERG. By azimuth, do you refer to the crosshair which is sometimes referred to as the windage crosshair?

Mr. SIMMONS. Yes.

Mr. EISENBERG. Would you recognize these shims that I display to you, Mr. Simmons, as being the shims that were placed in the weapon?

Mr. SIMMONS. I saw the shims only when they were in the weapon, but those look very much like what was evident from the external view, after they were in place.

Mr. EISENBERG. For the record, Mr. Chairman, these shims were given to me by the FBI who told me that they had removed them from the weapon after they had been placed there by Mr. Simmons' laboratory.

May I have these introduced as evidence?

Mr. McCLOY. Yes.

Mr. EISENBERG. Mr. Simmons, I find there are three shims here. You mentioned two. Would three be consistent with what you were told?

Mr. SIMMONS. I was told two. These were put in by a gunsmith in one of our machine shops—rather a machinist in one of our machine shops.

Mr. EISENBERG. Mr. Simmons, I wonder whether you could take these shims back after I have marked them to find out whether the three had been placed?

Mr. SIMMONS. Yes.

Mr. EISENBERG. I am marking these 576, 577, and 578. They consist of three shims in three small envelopes.

(The items referred to were marked Commission Exhibits Nos. 576, 577, and 578, and received in evidence.)

Mr. EISENBERG. Mr. Simmons, did you have a test run to determine the possibility of scoring hits with this weapon, Exhibit 139, on a given target at a given distance under rapid-fire conditions?

Mr. SIMMONS. Yes; we did. We placed three targets, which were head and shoulder silhouettes, at distances of 175 feet, 240 feet, and 265 feet, and these distances are slant ranges from the window ledge of a tower which is about 30 feet high. We used three firers in an attempt to obtain hits on all three targets within as short a time interval as possible.

I should make one comment here relative to the angular displacement of the targets. We did not reproduce these angles exactly from the map which we had been given because the conditions in the field were a little awkward for this. But the distance—the angular distance from the first target to the second was greater than from the second to the third, which would tend to correspond to a longer interval of time between the first and second impact than between the second and the third. The movement of the rifle was greater from the first to the second target than from the second to the third.

Mr. EISENBERG. Mr. Simmons, were your marksmen instructed to aim at the three targets in consecutive order?

Mr. SIMMONS. The marksmen were instructed to take as much time as they desired at the first target, and then to fire—at the first target, being at 175 feet—to then fire at the target emplaced at 240 feet, and then at the one at 265 feet.

Mr. EISENBERG. Can you state where you derived these distances?

Mr. SIMMONS. These distances were the values given on the survey map which were given to us.

Mr. EISENBERG. Are you sure they were not the values I gave to you myself?

Mr. SIMMONS. I stand corrected. These are values—we were informed that the numbers on the survey map were possibly in error. The distances are very close, however.

Mr. EISENBERG. For the record, the figures which I gave Mr. Simmons are approximations and are not to be taken as the Commission's conclusive determination of what those distances are.

Mr. SIMMONS. For our experiment, I do not see how a difference of a few feet would make any difference.

Mr. EISENBERG. Now, Mr. Simmons, did you take pictures or have pictures taken showing what that range looked like?

Mr. SIMMONS. Yes; I have copies of these pictures here. I show you three pictures—the first showing the window from which the weapon was fired in our experiments; the second showing the view of the three targets from the window; and the third showing a rifleman in position.

Mr. EISENBERG. Mr. Simmons, did you take these pictures yourself?

Mr. SIMMONS. No; these pictures were taken by one of the cameramen from the development and proof services.

Mr. EISENBERG. Did you see the scenes represented in these pictures?

Mr. SIMMONS. Yes.

Mr. EISENBERG. Are these pictures accurate reproductions of these scenes?

Mr. SIMMONS. Yes, sir.

Mr. EISENBERG. Mr. Chairman, I would like to have the first, second, and third pictures described by Mr. Simmons admitted as exhibits. That will be 579 for the first, 580 for the second, and 581 for the third.

Mr. McCLOY. They may be admitted.

(The photographs referred to were marked Commission Exhibits Nos. 579, 580, and 581 and received in evidence.)

Mr. EISENBERG. Mr. Simmons, the targets were—well, can you describe the targets for us?

Mr. SIMMONS. The targets are standard head-and-shoulders silhouettes, and they consist of approximately 2 square feet in area.

Mr. EISENBERG. How many marksmen were involved?

Mr. SIMMONS. We used three riflemen.

Mr. EISENBERG. And can you tell us what their background was?

Mr. SIMMONS. Yes. All three riflemen are rated as Master by the National Rifle Association. Two of them are civilian gunners in the Small Arms Division of our Development and Proof Services, and the third is presently in the Army, and he has considerable background as a rifleman, and also has a Master rating.

Mr. EISENBERG. Each fired one or more series of three rounds?

Mr. SIMMONS. Each fired two series of three rounds, using the telescopic sight. Then one of the firers repeated the exercise using the iron sight—because we had no indication whether the telescope had been used.

Mr. EISENBERG. So the total number of rounds fired was what?

Mr. SIMMONS. 21.

Mr. EISENBERG. Did you bring with you targets or copies of the targets?

Mr. SIMMONS. I brought photos of the targets.

Mr. EISENBERG. Did you take these photographs, Mr. Simmons, or have them taken under your supervision?

Mr. SIMMONS. These photographs were taken by the photographic laboratory in our Ballistic Measurements Laboratory, which is one of the complex of laboratories within the Ballistic Research Laboratory.

Mr. EISENBERG. Can you verify these photographs as being accurate reproductions of the targets?

Mr. SIMMONS. Yes, sir.

Mr. EISENBERG. Mr. Chairman, may I have these admitted as 582, 583 and 584?

Mr. McCLOY. They may be admitted.

(The photographs referred to were marked Commission Exhibits Nos. 582, 583, and 584 for identification and received in evidence.)

Mr. EISENBERG. Mr. Simmons, could you discuss the results of the tests you ran, by using these photographs?

Mr. SIMMONS. Exhibit 582 is the target which was emplaced at 175 feet. All firers hit the first target, and this was to be expected, because they had as much time as they desired to aim at the first target.

As you can see from the picture, the accuracy of the weapon is quite good.

Mr. McCLOY. That first target is what distance?

Mr. SIMMONS. 175 feet. And we had to make an assumption here about the point of aim. It is quite likely that in fact each man was aiming at a different portion of the target—there were no markings on the target visible to the firer.

Mr. EISENBERG. Did I understand you just told the firers to aim at the target without referring to—

Mr. SIMMONS. Yes.

Mr. EISENBERG. There is an apparent crossline running darkly through that photograph.

Mr. SIMMONS. These lines were drawn in afterwards, in order for us to make some measurements from the actual impact point.

The target which was emplaced at 240 feet, as shown in Exhibit 583—we had rather an unusual coincidence with respect to this target. This involved the displacement of the weapon to a sufficient angle that the basic firing position of the man had to be changed. And because they knew time was very important, they made the movement very quickly. And for the first four attempts, the firers missed the second target. Of course, we made a rather, I guess, disadvantageous error in the test by pointing out that they had missed on the second target, and there was a conscious effort made on the additional rounds to hit the second target.

On the third target, the angle through which the weapon had to be moved to get to the third target from the second was relatively small, and there were only two rounds which did not hit the target at 270 feet. One of these rounds, by the way, was used in the sequence where the iron sight was employed.

Mr. EISENBERG. Mr. Simmons, when you said that the firers had to make a large shift relatively in their firing position, and were in a hurry, is this your interpretation or is this based on discussions with them subsequently?

Mr. SIMMONS. This is based on discussions with the firers after the experiment.

Mr. EISENBERG. After these tests were finished, did you make a determination of the amount of error—average amount of error in the aim of these riflemen?

Mr. SIMMONS. Yes. By assuming that all riflemen had aimed at the intersection of the lines that we have drawn on these pictures, we calculated the total aiming—the aiming error associated with the three riflemen—this is one number to describe the accuracy of all three riflemen. And against the first target the accuracy observed was about .7 mils, in standard deviation. Against the second target, the accuracy was 1.4 mils. And against the third target, it was 1.2 mils.

Mr. EISENBERG. Again, could you convert those at a hundred yards to inches?

Mr. SIMMONS. 0.7 of a mil at 100 yards is approximately 2 inches. 1.4 mils is approximately 4 inches. And 1.2 mils is approximately 3½ inches.

Mr. EISENBERG. In arriving at these figures, had you discounted the round-to-round dispersion as determined in the bench rest test?

Mr. SIMMONS. Yes. We have subtracted out the round-to-round dispersion.

Mr. EISENBERG. But the actual accuracy of the riflemen would have to include the round-to-round dispersion, would it not?

Mrs. SIMMONS. Yes; it would.

Mr. EISENBERG. Why did you then subtract the round-to-round dispersion figure, or discount it?

Mr. SIMMONS. We wanted to determine what the aiming error itself was associated with the rifle.

Mr. EISENBERG. Can you give us the times in which the various riflemen used to fire the three shots in each sequence?

Mr. SIMMONS. Yes. And the numbers which I will give you will be the average of two readings on stop watches.

Mr. EISENBERG. For each rifleman?

Mr. SIMMONS. For each exercise.

Mr. Hendrix fired twice. The time for the first exercise was 8.25 seconds; the time for the second exercise was 7.0 seconds.

Mr. Staley, on the first exercise, fired in 6¼ seconds; the second attempt he used 6.45 seconds.

Specialist Miller used 4.6 seconds on his first attempt, 5.15 seconds in his second attempt, and 4.45 seconds in his exercise using the iron sight.

Mr. EISENBERG. What was the accuracy of Specialist Miller?

Mr. SIMMONS. I do not have his accuracy separated from the group.

Mr. EISENBERG. Is it possible to separate the accuracy out?

Mr. SIMMONS. Yes; it is, by an additional calculation.

Mr. Miller succeeded in hitting the third target on both attempts with the telescope. He missed the second target on both attempts with the telescope,

but he hit the second target with the iron sight. And he emplaced all three rounds on the target, the first target.

Mr. EISENBERG. How did he do with the iron sight on the third target?

Mr. SIMMONS. On the third target he missed the boards completely. And we have not checked this out. It appears that for the firing posture which Mr. Miller—Specialist Miller uses, the iron sight is not zeroed for him, since his impacts on the first and second targets were quite high, and against the third target we would assume that the projectile went over the top of the target, which extended only a few inches over the top of the silhouette.

Mr. EISENBERG. What position did the rifleman fire from, Mr. Simmons?

Mr. SIMMONS. The firers braced an elbow on the window sill and used pretty much a standard sitting position, using a stool.

Mr. EISENBERG. How much practice had they had with the weapon, Exhibit 139, before they began firing?

Mr. SIMMONS. They had each attempted the exercise without the use of ammunition, and had worked the bolt as they tried the exercise. They had not pulled the trigger during the exercise, however, because we were a little concerned about breaking the firing pin.

Mr. EISENBERG. Could you give us an estimate of how much time they used in this dry-run practice, each?

Mr. SIMMONS. They used no more than 2 or 3 minutes each.

Mr. EISENBERG. Did they make any comments concerning the weapon?

Mr. SIMMONS. Yes; there were several comments made—particularly with respect to the amount of effort required to open the bolt. As a matter of fact, Mr. Staley had difficulty in opening the bolt in his first firing exercise. He thought it was completely up and it was not, and he had to retrace his steps as he attempted to open the bolt after the first round.

There was also comment made about the trigger pull, which is different as far as these firers are concerned. It is in effect a two-stage operation where the first—in the first stage the trigger is relatively free, and it suddenly required a greater pull to actually fire the weapon.

Mr. EISENBERG. Mr. Simmons, did you prepare a table showing the probability of hit at a given target at given ranges by riflemen with given degrees of accuracy?

Mr. SIMMONS. Well, we prepared a table which showed what the probability of a hit would be on specific sizes of target as a function of aiming error, and using the appropriate round-to-round dispersion also in these calculations.

Mr. EISENBERG. What were the targets that you used in your calculations?

Mr. SIMMONS. We used two circular targets, one of 4 inches in radius and one of 9 inches in radius, to approximate the area of the head and the area of the shoulders, or the thorax, actually. And a significant point to these calculations to us is that against the larger target, if you fire with the 0.7 mil aiming error which was observed against the first target, the probability of hitting that target is 1, and it is 1 at all three ranges, out to 270 feet.

Mr. EISENBERG. Can you explain the meaning of the probability being 1?

Mr. SIMMONS. Well, the probability is effectively one. Actually the number is 0.99 and several more digits afterwards. It is rounded off to 1. Simply implying that the probability of a hit is very high with the small aiming errors and short range.

Mr. EISENBERG. Now of course this aiming error is derived from the three riflemen who you employed in the tests, is that correct?

Mr. SIMMONS. Yes.

Mr. EISENBERG. Could you proceed to the other two?

Mr. SIMMONS. Using the 1.2 mil aiming error, again at the larger targets, the probability of hitting the target at 175 feet is 1; at 240 feet it is 0.96; and at 270 feet it is 0.92.

Mr. EISENBERG. How would you characterize the second two figures in terms of probability?

Mr. SIMMONS. These also are very high values.

Mr. EISENBERG. The mil figure was 1.2, was it?

Mr. SIMMONS. Yes.

Mr. EISENBERG. Does that include, did you say, both aiming error and round-to-round dispersion?

Mr. SIMMONS. The 1.2 is the aiming error. When we include the round-to-round dispersion, it becomes only 1.24 mils.

Mr. EISENBERG. Does the probability reflect the 1.2 or the 1.24 figure?

Mr. SIMMONS. It reflects the total error, which is 1.24.

Mr. EISENBERG. And the same on the first series of calculations you gave us?

Mr. SIMMONS. Yes.

Mr. EISENBERG. Would you go on to the third?

Mr. SIMMONS. Using the 1.4 mil aiming error, and the round-to-round dispersion, giving a total error of 1.43 mils, the probability of hit at the 175 foot target is 0.99; at 240 feet it is 0.91; at 270 feet it is 0.85.

Mr. EISENBERG. Could you give us the figures for the smaller target?

Mr. SIMMONS. Using the 0.7 mil aiming error, the probability of a hit at 175 feet is 0.96; at 240 feet, 0.81; at 270 feet, 0.73.

For the 1.2 mil aiming error, the probability is 0.69 at 175 feet; 0.74 at 240 feet; 0.39 at 270 feet.

Using the—

Mr. EISENBERG. Can you characterize those, or explain them in lay terms?

Mr. SIMMONS. Well, against a shorter target, the probability is still almost 0.7, which is a relatively high value. The effective-range increase is beginning to show, however, because at 270 feet the value of 0.4 tends to be small.

Mr. EISENBERG. Does 0.4 mean you have 4 chances in 10 of hitting?

Mr. SIMMONS. Yes.

Now, our assumption throughout all of this is that the actual target was probably not either a small—the small area, but tending to be a larger area, as indicated by the crosshairs in these targets which we placed at this point.

Mr. EISENBERG. Now, you have given us probabilities of hit with three variations of aiming error. You have selected these three variations in what manner, Mr. Simmons?

Mr. SIMMONS. These were actually the three values which were demonstrated in the experiment.

Mr. EISENBERG. But each of those values is associated with one target?

Mr. SIMMONS. Yes.

Mr. EISENBERG. However, you have applied them to all three targets?

Mr. SIMMONS. Yes.

Mr. EISENBERG. Did you have a special reason for doing that?

Mr. SIMMONS. No. We are victims of habit, and we tend to provide such information in parametric form.

Mr. EISENBERG. Now, Mr. Simmons, of course the assassin's aiming error must be unknown. But do you have any opinion concerning the probable aiming error of an assassin using this weapon against the aiming error displayed by the three riflemen you employed?

Mr. SIMMONS. Well, it looks like to achieve hits as indicated, the accuracy, overall accuracy of the three rounds would have to be of the order of 1.2 mils. And this is really not a small number as far as marksmanship goes. There have been many exercises in which we have been involved where the aiming error turns out to be much smaller, smaller than this. And in match competition, of course, the numbers actually turn out to be—the total aiming error turns out to be about equal to the round-to-round dispersion.

Mr. EISENBERG. When you make the reference to many exercises, are you referring to exercises solely with skilled riflemen?

Mr. SIMMONS. If we have skilled riflemen, the values for aiming error tend to be of the order of 1 mil. As a matter of fact, to qualify as expert on Army rifle courses, about a 1 mil aiming error is required—a standard deviation of 1 mil.

Mr. EISENBERG. Is that with a rest or without a rest?

Mr. SIMMONS. This would be without a rest. This would be the actual aiming error from the fixed position, firing range.

Mr. EISENBERG. And is this with open or telescopic sights?

Mr. SIMMONS. This would be with the peepsight on the conventional rifle.

Mr. EISENBERG. Have you exercises which you feel would be applicable to the

assassination—that is, exercises conducted with—under noncombat conditions, with a telescopic sight and a rest?

Mr. SIMMONS. The only experience that we have with the telescopic sight with which I am familiar is the exercise using this weapon. There have been experiments made using telescopic sights, but these are of limited interest militarily.

Mr. EISENBERG. In your opinion, what effect does the introduction of a rest and telescopic sight have on probable aiming error?

Mr. SIMMONS. From a position where the movement of the weapon is not great, and where the target is slowly moving, the fixed position on the telescope should enhance the probability of a hit.

Mr. EISENBERG. Do you think a marksman who is less than a highly skilled marksman under those conditions would be able to shoot in the range of 1.2-mil aiming error?

Mr. SIMMONS. Obviously considerable experience would have to be in one's background to do so. And with this weapon, I think also considerable experience with this weapon, because of the amount of effort required to work the bolt.

Mr. EISENBERG. Would do what? You mean would improve the accuracy?

Mr. SIMMONS. Yes. In our experiments, the pressure to open the bolt was so great that we tended to move the rifle off the target, whereas with greater proficiency this might not have occurred.

Mr. EISENBERG. Could this experience in operating the bolt be achieved in dry practice, Mr. Simmons?

Mr. SIMMONS. Yes; it could be, if sufficient practice were used. There is some indication of the magnitude of change with one of our shooters who in his second attempt fired three-tenths of a second less time than he did in the first.

Mr. EISENBERG. Mr. Simmons, has data been compiled showing the effect of the time taken between shots on the accuracy of the shots?

Mr. SIMMONS. There have been experiments run where aiming error has been measured as a function of the time one has to aim.

Mr. EISENBERG. Do those experiments show that aiming error is directly proportionate to the length of time one has to aim?

Mr. SIMMONS. Not directly proportionate, but aiming error decreases as time increases. But once you get to the area of about 4 seconds in time, then there is very small decrease in aiming error for increase in time.

Mr. EISENBERG. Translating that to this weapon, does that mean that taking more than 8 seconds between three shots should not appreciably affect the degree of accuracy?

Mr. SIMMONS. The 8 seconds I was referring to is between shots.

Mr. EISENBERG. You said 4 seconds, I thought.

Mr. SIMMONS. I beg your pardon.

Mr. EISENBERG. And I was saying, if you took 4 seconds between the first and second, and 4 seconds between the second and third, for a total of 8 seconds, on the basis of this data would that mean after 8 seconds you would not be substantially increasing your accuracy by taking more time?

Mr. SIMMONS. That is correct.

Mr. EISENBERG. Approximately how many bullets did you fire in the course of your tests?

Mr. SIMMONS. We fired 47 bullets.

Mr. EISENBERG. Did you have any misfires?

Mr. SIMMONS. None.

Mr. EISENBERG. Were you aware when you performed your tests of the conclusions of any other body concerning the accuracy of this weapon?

Mr. SIMMONS. No; we were not.

Mr. EISENBERG. Are you aware of such conclusions at this point?

Mr. SIMMONS. No; I am not.

Mr. EISENBERG. Mr. Chairman?

Mr. McCLOY. You said that these riflemen, or one or two of them at least, had the rank of master. What is that?

Mr. SIMMONS. I again fall back on my comment earlier that I am not a shooter myself. A master is one of the ratings given to highly qualified rifle-

men by the National Rifle Association. These men have all participated in national match competitions in the National Rifle Association.

Mr. McCLOY. Is that a higher grade than sharpshooter in the Army?

Mr. SIMMONS. There is really no comparison between the rating of master in the NRA and the rating of sharpshooter in the Army.

Mr. EISENBERG. I am not sure whether or not you answered this question, but do you feel that if the target was moving, rather than having the rifleman move, there would have been a difference in aiming error, increased or decreased aiming error—if the target was moving 5 to 10 miles an hour?

Mr. SIMMONS. I think the movement of the target in this case would have practically no effect on the accuracy of fire, because from the map we are led to believe that the movement was primarily away from the firer, so that the back of the President was fully exposed to the rifleman at all times.

Mr. EISENBERG. Could you explain your reference to a map? You have made several references to that.

Mr. SIMMONS. I refer to the survey plat which is dated December 5, 1963.

Mr. EISENBERG. And how were you supplied with that?

Mr. SIMMONS. To the best of my knowledge, you gave it to one of the employees in my office.

Mr. EISENBERG. Mr. Chairman, this is a plat made by a licensed surveyor of the area immediately adjoining the Texas School Book Depository. I would like to introduce it into evidence solely to show the basis which Mr. Simmons was using in his test, and not for the truth of the measurements which are shown in here.

Mr. McCLOY. It may be received.

Mr. EISENBERG. That would be Commission 585.

(The document referred to was marked Commission Exhibit No. 585 and received in evidence.)

Mr. EISENBERG. I have no further questions.

Mr. McCLOY. I have no further questions.

Mr. EISENBERG. Is there anything you would like to add to your testimony?

Mr. SIMMONS. I think not.

Mr. EISENBERG. I wonder whether we could have a copy of your table?

Mr. SIMMONS. Yes.

Mr. McCLOY. From your experience, Mr. Simmons, do you feel that with a man who had been in the Marine Corps, with the rifle instruction he had there, using this rifle, and what you know of the shots that killed the President—do you think he was an extraordinarily good shot, do you think he was just shooting in accordance with what might be taken to be the skill that service in the Marine Corps would give him?

Mr. SIMMONS. Well, in order to achieve three hits, it would not be required that a man be an exceptional shot. A proficient man with this weapon, yes. But I think with the opportunity to use the weapon and to get familiar with it, we could probably have the results reproduced by more than one firer.

Mr. McCLOY. I think that is all.

Mr. EISENBERG. One thing, Mr. Chairman. May I have this admitted as 586, this table which Mr. Simmons prepared, from which he was giving testimony earlier? This is "Table I, Hit Probability as a Function of Range and Aiming Error."

Mr. McCLOY. It may be admitted.

(The table referred to was marked Commission Exhibit No. 586 and received in evidence.)

Mr. EISENBERG. When you say proficiency with this weapon, Mr. Simmons, could you go into detail as to what you mean—do you mean accuracy with this weapon, or familiarity with the weapon?

Mr. SIMMONS. I mean familiarity basically with two things. One is the action of the bolt itself, and the force required to open it; and two, the action of the trigger, which is a two-stage trigger.

Mr. EISENBERG. Can familiarity with the trigger and with the bolt be acquired in dry practice?

Mr. SIMMONS. Familiarity with the bolt can, probably as well as during live firing. But familiarity with the trigger would best be achieved with some firing.

Mr. EISENBERG. Why is there this difference between familiarity with the bolt and familiarity with the trigger in dry firing?

Mr. SIMMONS. There tends to be a reaction between the firer and the weapon at the time the weapon is fired, due to the recoil impulse. And I do not believe the action of the bolt going home would sufficiently simulate the action of the recoil of the weapon.

Mr. EISENBERG. One further question.

Looking at the figures for aiming error, as discounted by round-to-round dispersion, how would you characterize the actual performance of men with this rifle—that is, not the accuracy of the weapon, but the accuracy of man and weapon.

Mr. SIMMONS. I am not sure I understand your question.

Mr. EISENBERG. Do you feel on the basis of the aiming error, discounted for round-to-round dispersion or including it, that this weapon is an easy one with which to be accurate, or a difficult one?

Mr. SIMMONS. It appears to be relatively conventional in that regard, I assume. The telescope helps in the accuracy against a target which is well displayed, as was the case here. And the weapon is reasonably conventional. So that I think it would not be significantly different from any other weapon.

Mr. McCLOY. If you were having a dry run with this, you could certainly make yourself used to the drag in the trigger without discharging the rifle, could you not?

Mr. SIMMONS. Yes. But there are two stages to the trigger. Our riflemen were all used to a trigger with a constant pull. When the slack was taken up, then they expected the round to fire. But actually when the slack is taken up, you tend to have a hair trigger here, which requires a bit of getting used to.

Mr. McCLOY. This does not have a hair trigger after the slack is taken up?

Mr. SIMMONS. This tends to have the hair trigger as soon as you move it after the slack is taken up. You achieve or you feel greater resistance to the movement of the trigger, and then ordinarily you would expect the weapon to have fired, and in this case then as you move it to overcome that, it fires immediately. And our firers were moving the shoulder into the weapon.

Mr. McCLOY. I have no further questions.

Mr. EISENBERG. That is all.

Mr. McCLOY. Thank you very much. You have been very helpful.

We shall recess now until 9 o'clock tomorrow morning.

(Whereupon, at 5:25 p.m., the President's Commission recessed.)

Wednesday, April 1, 1964

TESTIMONY OF CORTLANDT CUNNINGHAM AND JOSEPH D. NICOL

The President's Commission met at 9 a.m. on April 1, 1964, at 200 Maryland Avenue NE., Washington, D.C.

Present were Chief Justice Earl Warren, Chairman; Representative Hale Boggs, Representative Gerald R. Ford, and Mr. Allen W. Dulles, members.

Also present were Melvin Aron Eisenberg, assistant counsel; Norman Redlich, assistant counsel; Samuel A. Stern, assistant counsel; Charles Murray and Charles Rhyne, observers.

TESTIMONY OF CORTLANDT CUNNINGHAM

The CHAIRMAN. The Commission will be in order.

Mr. Cunningham, the purpose of today's hearing is to take the testimony of yourself and Mr. Joseph Nicol. We understand that you are a firearms expert with the FBI, and Mr. Nicol is a firearms expert with the Bureau of Criminal