

Prepared Statement
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Mr. Chairman and Members of the Committee, I very much appreciate the opportunity to appear before you today to discuss the comparative body armor tests sponsored by NBC and conducted in Germany early last month.

I last appeared before the Air/Land Subcommittee of this full Committee on January 18, 2007. Then as now I provide a description of my affiliations; I do not have a financial conflict of interest in this matter. This declaration constitutes the first section of my prepared statement. I would like to submit my entire statement for the record.

I currently am employed as a Senior Advisor to the non-profit Center for Defense Information, a division of the World Security Institute, a Washington, D.C.-based national security study center. To help insure our independence, the World Security Institute and the Center for Defense information do not accept any funding from the Federal government, nor from any defense contractors.

From 1994 to 2001 I served in the Pentagon as Assistant Secretary of Defense and Director, Operational Test and Evaluation. In this capacity, I was principal advisor to the Secretary of Defense and the Undersecretary of Defense for Acquisition, Technology and Logistics on test and evaluation in the DOD. I had OSD OT&E responsibility for over 200 major defense acquisition systems.

From 1959 to 1979, and again from 1981 to 1993, I worked at the Lawrence Livermore National Laboratory. Over those 33 years I worked on a variety of high technology programs, and retired from the Laboratory in 1993 as Laboratory Associate Director and deputy to the Director. During the Carter administration I served as Principal Deputy Assistant Secretary for Defense Programs in the Department of Energy.

In my current capacity at the Center for Defense Information I provide independent expertise to the media on various defense matters. I have over 30 years of test and test-related experience involving U.S. defense systems and equipment. Knowing my background, NBC invited me to observe side-by-side body armor tests that were conducted by the Beschussamt Mellrichstadt ballistics laboratory in Germany on May 3, 2007.

My role was to observe those tests, to provide advice and commentary where I saw fit, and I neither requested nor received any compensation from NBC for my time spent traveling to the test laboratory nor for observing the tests.

Introduction

This Committee needs to be open-minded about looking at the questions which the NBC body armor tests have raised.

I say this because you know that body armor is of critical importance to US military personnel in Iraq and Afghanistan. However, in the recent past this Committee has not shown itself to be open-minded on issues raised by NBC. I refer to NBC reporting on Active Protection Systems. The House Armed Services Committee held two hearings to denounce NBC for raising that issue, and those hearings did not engage the specific facts which NBC raised. In the course of those two hearings this Committee received testimony from the US Army which was misleading and, sometimes, just plain wrong.

On the positive side, after those two hearings, Senator John Warner requested an independent study of Active Protection Systems. That study was completed two months ago by the Institute for Defense Analyses (IDA) and showed that NBC was correct. The IDA study showed that the Trophy Active Protection System was the farthest along, as NBC had reported, and ranked the system which the Army and this Committee favored, the Raytheon "Quick Kill" system, ninth in terms of technical readiness.

In short, the IDA report confirmed that NBC got it right.

With respect to the questions NBC has raised on body armor, I hope this Committee will consider that NBC may have gotten it right again.

The NBC Body Armor Tests ~ The Results

From the outset it was apparent that NBC would not have the capacity to conduct full-scale body armor tests that would capture all of the variables of importance to the US Army. For example, NBC did not conduct tests at high or low temperatures; all the rounds fired in the NBC body armor tests were fired at ambient temperature.

Nevertheless, it was important for NBC to be sure that their tests, although limited, were fair and conducted according to professional standards, which I can attest they were.

The results of the NBC tests - which are summarized on their web site - were significant. The tests showed that the Army's Interceptor body armor meets minimum US Army requirements, something which I myself noted on camera. The NBC tests also showed that the ballistic protection from Dragon Skin body armor is better.

This testimony now reports on the results of the ballistics tests commissioned by NBC News and conducted on May 3, 2007, in Germany. At NBC's request, the Beschussamt Mellrichstadt laboratory performed comparative testing of the Army's body armor, Interceptor, which employs rigid plates inserted into large pockets in an outer vest, against Dragon Skin, a flexible body armor that employs a series of overlapping discs each a little larger in diameter than a silver dollar. The Beschussamt Mellrichstadt Laboratory is well familiar with the specifications governing body armor testing, regularly conducts body armor tests, and has an outstanding reputation as "the BMW" of ballistics testing labs.

Body armor vests are tested against a special kind of soft clay that simulates the resistance of the human body and provides a way to measure blunt force trauma. After each shot, each vest is removed to assess whether or not the bullet has penetrated the body armor, and if not, to measure the blunt shock trauma to a person wearing the vest. The US Army generally considers a cavity deeper than 44 mm to be a failure, even if the bullet does not penetrate, because the shock can be so great that the wearer of the body armor could die anyway. (The Army standard is 47 mm for certain armor piercing ammunition.) The sternum is a particularly dangerous area for blunt shock

trauma as chest bones can be broken and propelled into the heart, lungs, etc. A ruptured spleen, or other damaged organs can be very dangerous, if not fatal, also.

The measure of this blunt force trauma is called the “BFS” or “Back Face Signature,” that is, the depth of the indentation caused in the clay when a bullet strikes a body-armor vest. NBC quotes the National Institute of Justice when explaining this procedure, “When armor is tested, it is mounted on clay backing material whose consistency is controlled. After the shot, the depth of the clay deformation behind the armor panel is measured and recorded as the BFS.”

The NBC tests consisted of six groups of test firings, involving a total of 31 rounds of ammunition of different types and lethalties.

Test #1 – Dragon Skin Only

Before comparative testing began, a preliminary series of six shots were fired against Dragon Skin only using 7.62 caliber x51 mm M80 rounds. This is called a Level III threat, meaning capable of defending against high powered rifle ammunition, and both Dragon Skin and Interceptor are NIJ certified at this level. The Army requires that three rounds be defeated; the NIJ requires that 6 rounds be defeated. In this first test series six rounds were fired at Dragon Skin body armor and it stopped all six rounds allowing no penetrations. The back face signatures were well within the Army standard, being 30, 35, 31, 25, 29 and 29 millimeters, respectively.

This test series showed that Dragon Skin could defeat this threat and meet both the Army standard and the tougher NIJ standard.

Test #1a and 1b – First Comparative Tests

From this point forward in this open testimony I do not speak to the specific caliber or construction of each round fired in the NBC sponsored tests. Similarly, in their broadcast and on their website, NBC News did not describe the specific caliber or construction of ammunition used in the tests, because the Army believes that level of detail may assist the enemy. NBC News did, however, share those details with the Army, and the Army itself reported some of those details in an open press conference on May 21.

Test 1a, the first of the comparative test series, consisted of four rounds of a type of armor piercing ammunition fired against an Interceptor Level IV vest with Enhanced Small Arms Protective Inserts (ESAPI plates) installed in an outer vest. Level IV refers to a higher level threat from armor piercing ammunition.

TEST #1a Conducted on INTERCEPTOR Level IV vest with ESAPI Plates

One round of armor piercing ammunition. *Results: no penetration and BFS of 30mm*

Additional round of armor piercing ammunition. *Results: no penetration and BFS of 32mm*

Additional round of armor piercing ammunition. *Results: no penetration and BFS of 47mm*

Additional round of armor piercing ammunition. *Results: COMPLETE PENETRATION*

This test showed that the Army’s Interceptor body armor meets minimum US Army standards for this type of round at ambient temperature which only require body armor to stop one round of this type of ammunition. However, when taken to a third and fourth round, the blunt force

trauma on the third round was high, 47 mm, and on the fourth shot there was a complete penetration of the Interceptor body armor.

Test #1b, the second test series, consisted of six rounds of the same type of armor piercing round as was fired in Test 1a, but now fired against Dragon Skin.

TEST #1b Conducted on DRAGON SKIN Level IV Vest

1 round of armor piercing ammunition. *Results: no penetration and BFS of 23mm*

Additional round of armor piercing ammunition. *Results: no penetration and BFS of 23mm*

Additional round of armor piercing ammunition. *Results: no penetration and BFS of 27mm*

Additional round of armor piercing ammunition. *Results: no penetration and BFS of 24mm*

Additional round of armor piercing ammunition. *Results: no penetration and BFS of 23mm*

Additional round of armor piercing ammunition. *Results: no penetration and BFS of 20mm.*

This test showed that Dragon Skin also meets the US Army's standards for this type of round at ambient temperature. Better still, Dragon Skin allowed no penetrations in six rounds fired, and the blunt force trauma from each was significantly less than with Interceptor. On average, the Back Face trauma signature was 56% greater with Interceptor than with Dragon Skin.

This test also was significant because the Army has indicated that in its test of Dragon Skin last year that Dragon Skin could not defeat this type of ammunition. In the tests that I observed it clearly did, and never failed.

Tests #2a and #2b – Second Comparative Tests

Test #2a was conducted with a type of armor piercing incendiary ammunition and consisted of six rounds fired at the Army's Interceptor body armor.

Test #2a Conducted on INTERCEPTOR Level IV vest with ESAPI Plates

One round of armor piercing incendiary ammunition. *Results: no penetration and BFS of 34mm*

Additional round of armor piercing incendiary ammunition. *Results: no penetration and BFS of 41mm*

Additional round of armor piercing incendiary ammunition. *Results: no penetration and BFS of 37mm*

Additional round of armor piercing incendiary ammunition. *Results: no penetration and BFS of 43mm*

Additional round of armor piercing incendiary ammunition. *Results: no penetration but BFS of 51mm (FAILS BFS STANDARD)*

Additional round of armor piercing incendiary ammunition. *Results: COMPLETE PENETRATION*

This test showed that the Interceptor body armor can stop this type of armor piercing incendiary ammunition, but when taken to a fifth round the blunt force trauma exceeded general Army standards, and the sixth round allowed a complete penetration.

Test #2b was conducted with the same type of armor piercing incendiary ammunition as in Test 2a but now against Dragon Skin. Six rounds were fired.

Test #2b Conducted on DRAGON SKIN Level IV Vest

One round of armor piercing incendiary ammunition. *Results: no penetration and BFS of 26mm*

Additional round of armor piercing incendiary ammunition. *Results: no penetration and BFS of 23mm*

Additional round of armor piercing incendiary ammunition. *Results: no penetration and BFS of 26mm*

Additional round of armor piercing incendiary ammunition. *Results: no penetration and BFS of 23mm*

Additional round of armor piercing incendiary ammunition. *Results: no penetration and BFS of 11mm*

Additional round of armor piercing incendiary ammunition. *Results: no penetration and BFS of 27mm.*

This test showed that Dragon Skin can defeat this type of armor piercing incendiary round, as it did six times. There were no penetrations and the depth of the blunt force trauma signature was dramatically less than for Interceptor. On average, in this test series, the Back Face trauma depth was nearly 82% higher for Interceptor than for Dragon Skin.

Test #3 – Dragon Skin only

Test #3 was of Dragon Skin alone. The ammunition fired was of a composite nature. The Army does not require its body armor to defend against a bullet of this lethality. Three rounds were fired.

Test #3 Conducted on DRAGON SKIN Level IV Vest

1 round of armor piercing ammunition of a “composite” nature. *Results: no penetration and BFS of 22mm*

Additional round of armor piercing ammunition of a “composite” nature. *Results: no penetration and BFS of 20mm*

Additional round of armor piercing ammunition of a “composite” nature. *Results: no penetration and BFS of 14mm*

This test showed that Dragon Skin can defeat a highly lethal type of armor piercing ammunition. Also notable is that the Back Face trauma signature on these three shots averaged less than 19 mm, less than half of the Army’s standard, a standard which is only required for less lethal types of ammunition.

Army Briefings

Shortly after NBC briefed Brig. Gen. Mark Brown on the results from the NBC sponsored tests, Gen. Brown called to offer me a briefing from his Chief Scientist on the Army tests conducted by H.P. White in May 2006. I accepted, and a few days later Lt. Col. Karl Masters (USA Retired), a senior staff member of Gen. Brown, called to arrange to brief me in California.

In my experience there are PowerPoint briefings and there are PowerPoint Briefings, and it is often advisable to look at the actual data. For this reason, I asked Lt. Col. Masters before he came out to bring the actual test results from the tests conducted last year for the Army. Lt. Col. Masters indicated that he would.

When he arrived, he did not have those test results and said that “the rules had changed,” and that I could not see the test results unless I requested them in writing, which I did later that same day. I received an e-mail from Lt. Col. Masters a few days later saying that he had submitted my request to his chain of command and would advise me of the “outcome of adjudication” as soon as he knew it.

That was three weeks ago and I have not heard anything further.

Lt. Col. Masters told me that the briefing I received was originally prepared for Rep. Marcy Kaptur. The briefing to me was similar to what Brig. Gen. Brown used in his press conference on May 21.

To my understanding, there are discrepancies between the briefing I received and what actually happened. Although I have tried to resolve these discrepancies, without additional data from the Army, that is not possible.

For example, the briefing talks about 48 shots having been fired, but Lt. Col. Masters first told me 96 shots were fired at Dragon Skin vests in those tests, then later said it was 80 shots. In his May 21 press conference, Gen. Brown said that two shots each had been fired at the front back and sides, which would mean 64 shots fired at 8 vests. I believe the correct number is something like 88. In any case I believe it is not 48 shots as reported to this Committee and in the May 21st press conference.

Lacking the actual test results report, I have not been able to determine which of the 80-odd shots are being counted in the PowerPoint briefings, the conditions under which those shots were taken, or how all the shots were scored.

Also it appears to me that the Army's PowerPoint briefing is misleading in its comparison of body coverage between the Army's Interceptor body armor and Dragon Skin manufactured by Pinnacle Armor. In his briefing to me on last years Dragon Skin testing, Lt. Col. Masters told me that Interceptor's body coverage was compared to Dragon Skin without the armor plates that actually provide the protection. I commented at the time that I thought this was misleading, but got no response.

A fair comparison would measure how much coverage each of the vests provided. The disadvantage of the Army's system is there are gaps in the front, back and sides where bullets can get through. Pinnacle's Dragon Skin armor covers the whole torso.

In the briefing the Army presented to me, and in the briefing which Brig. Gen. Brown gave to the press on May 21, the Army stressed the overlapping nature of the discs in the Dragon Skin body armor, and showed how at some points two discs overlap, and at other points three discs overlap, leaving a portion of every disc where there is no overlap. The Army asserted that Dragon Skin could not be effective because over about 50% of the vest the discs are not overlapped. As Gen. Brown stated in his May 21 press conference, "So what you see, the laws of probability and statistics will take hold in the live-fire test. There's probably a 50 percent probability of impact in a single-disk coverage area." Gen. Brown went on to suggest that a single disc could not stop armor piercing ammunition. If this were true, Dragon Skin would have failed in a significant fraction of the ballistic tests in Germany, and it did not. In the tests of Dragon Skin that I observed there were no penetrations whatsoever, not by armor piercing rounds, not by armor piercing incendiary rounds, and not by an even tougher threat. And as I noted earlier the blunt force trauma with Dragon Skin was less than with Interceptor.

The Army has launched a powerful defense of its Interceptor system, and in its May 21 press conference had a very convincing display with two scales that showed Dragon Skin to be heavier. However, in the body armor tests which NBC sponsored in Germany, the ballistics laboratory weighed each vest before each shot series. There was a difference, the Dragon Skin panels were about a pound per side heavier, but nothing like the 19.5 pound difference shown by the Army. A fair weight comparison would be of vests of the same size, designed to defeat the same threats, allowing the manufacturer to trade off the weight of the outer tactical vest with weight in the ceramic armor to achieve the best overall protection for the US military. This is an example of how difficult it can be to compare test results a year apart, conducted under different circumstances, even when all that is involved is a simple comparison of weights.

Given the NBC test results, the continuing refusal of the Army to undertake side-by-side testing is puzzling. When NBC News reporter Lisa Myers asked Gen. Brown whether the Army would do side-by-side testing, Gen. Brown said that the Army doesn't do side-by-side testing but "tests to a standard." Of course they test to a standard, but NBC News tested both vests to the Army's standard and Dragon Skin performed better. Side-by-side testing means testing both types of body armor under the same conditions, according to the same scoring rules, in short, a level playing field.

In his recent press conference, Gen. Brown said that he had "all the money and all the leadership support" he needed "to get body armor and to get improvements to body armor." He also said that the Army is "never satisfied with the status quo," and that the Army is "always looking for the next best thing." And that if there is "something better out there, we're going to buy it -- after we've live-fire tested it."

If this is true, doing fair, contemporary side-by-side tests should not be a problem.

I am not saying that Interceptor doesn't provide good protection. Nor is retired Army Gen. Wayne Downing, who observed the tests with me. He noted on camera, as did I, that Interceptor performed well during the NBC News tests. But Dragon Skin was better, notably against multiple rounds and in reducing blunt force trauma, which can kill even if a bullet doesn't actually penetrate the vest.

Dragon Skin Advantages

From the body armor tests that I observed in Germany, Dragon Skin appears to have five advantages, advantages in which I would think the Army and this Committee would be interested. Those advantages appear to be:

1. Dragon Skin is flexible and conforms better to the contours of the human body, which is also helpful for female soldiers.
2. Dragon Skin covers more of the torso and does not leave gaps.
3. Dragon Skin is better against multiple shots.
4. Dragon Skin reduces blunt force trauma. The depth of cavities caused in the test clay by shots fired at Dragon Skin were often half as deep as the cavities caused in the clay during the Interceptor tests.
5. Dragon Skin performed perfectly, allowing no penetrations, and defeated six rounds of a particularly deadly ammunition threat which US troops in Iraq and Afghanistan may face.

Conclusion

Mr. Chairman, the controversy over the most effective body armor for the US Army has been brewing for a long time and was not started by NBC. NBC, ABC, CBS, The Discovery Channel, The History Channel, and the National Geographic Channel, that I know of, have all either aired programs on this controversy or plan to do so. This does not count the scores of print media sources who have reported on the body armor controversy. Even "YouTube" has pictures of Dragon Skin body armor testing on the internet, and Wikipedia has posted a carefully documented description of the history of this controversy. Some news organizations have shown successful ballistic tests of Dragon Skin body armor conducted on behalf of other agencies, such as police departments.

In addition, officials with the FBI, the CIA, the US Marshall Services, the GSA, the US Navy, the US Air Force, the Federal Protective Services, the Department of State, the Department of Energy, and the US Coast Guard have all bought or placed orders for Dragon Skin.

So also have private security firms that provide security protection for high ranking officials in Iraq or other dangerous places.

Mr. Chairman, since the original NBC programs aired, the Army has tried to discredit the NBC body armor tests, and to defend the results from the Army tests conducted last year, first in briefings to Members of Congress, then in an open press conference on May 21, and also in briefings to this Committee. The tests conducted by H.P. White for the Army in May 2006, and the NBC tests conducted this year can probably never be compared one for one. Too much time has passed since the tests a year ago, and the Army is overly invested in proving NBC wrong.

The best way to resolve this matter would be for the US Army Test and Evaluation Command to conduct comparable side-by-side tests of both Interceptor and Dragon Skin body armor. Those tests should be overseen by an independent third party such as the Director of Operational Test and Evaluation. This is what the Senate Armed Services Committee has called for, and I hope the

House Armed Services will join the Senate to call for a fair, balanced, and refereed body armor testing program.

I would be pleased to take any questions you might have.