VOLUME 6

BEFORE THE OFFICE OF ADMINISTRATIVE HEARINGS

OF THE STATE OF MINNESOTA

IN THE MATTER OF AN APPLICATION
FOR A CERTIFICATE OF NEED FOR
CONSTRUCTION OF AN INDEPENDENT
SPENT FUEL STORAGE INSTALLATION

OAH DOCKET NO. E-002/CN-91-19

715 American Center Building
150 East Kellogg Boulevard
St. Paul, Minnesota

Met, pursuant to notice, at 9:00 in the morning on November 25, 1991.

BEFORE: Judge Allan W. Klein

REPORTER: Lori A. Case

the cask itself.

Q What kinds of explosives did you subject the cask to during the mid '70s?

A The information on the precise explosive attacks is classified. We used eight different methods of attack. The two methods that are generally public knowledge are bulk explosives and shaped charges.

Q These were both types of explosives used by the military?

A Shaped charges are used by the military. The bulk explosive replicated an attack on the University of Wisconsin applied mathematics laboratory in 1973, I think it was, in which 4,000 pounds of an explosive known as ANFO -- that's A-N-F-O -- were used to destroy that laboratory.

Q Is ANFO a military explosive or a commercially available explosive?

A It is a popular low-grade terrorist explosive.

Q Are the results of those tests published anywhere?

A They are published, but classified.

Q And then in your direct testimony you refer to Sandia's scale modeling effort and full scale attack on a cask in the early '80s. Is that in 1983?

A I don't recall the exact date, but that would be about the right time frame, yes.

A The M-3A1 is still currently in the military inventory.
Q It was initially used during World War II?
A Correct.
Q Isn't the M-3A1 designed to create a large hole?
A It is primarily designed to blow holes in concrete structures.
Q But it isn't what they would call a focused charge or something that would create a small hole, a small penetrating hole; is that correct?
A As a matter of fact, a shaped charge if it is not focused is not a shaped charge, it doesn't function as a shaped charge unless it is focused.
Q I see. So it is focused, but its design is to create a large hole; is that true?
A It is a large diameter munition designed to create a large hole, that's true.
Q There are more focused explosives, and by that I mean explosives that are meant to create a smaller, more penetrating hole, manufactured today; is that true?
A There are.
Q Would you agree that the types and availability of explosives, both military and commercial, have changed quite a bit in the last 50 years since World

War II?

A They have.

Q Would you agree that the types and availability of explosives have changed significantly since the early '80s when you did the Sandia testing?

A Yes, but understand that the changes in explosives since the early '80s have to do with application more than energy.

Q Would you agree, then, that the M-3A1 is significantly outdated by modern armor piercing weaponry made of depleted uranium used in the Gulf War?

A Please restate the question. I didn't understand the whole thing.

Q I will.

THE JUDGE: If you take it a little slowly, too.

BY MS. ZELLMER:

Q Are you familiar with the type of armor piercing weaponry made with depleted uranium which was used in the Gulf War?

A Vaguely so.

Q Wouldn't you agree that the M-3A1 is significantly outdated by that type of weaponry?

A The M-3A1 is not an antitank weapon, so you are

A Exactly.
Q And they weren't subject to review by any other nonmilitary or nongovernmental entities?
A It is very difficult to find cleared people to do peer review.
Q So the answer is no?
A No.
Q Were commercial devices ever tested on casks at Sandia?
A Yes.
Q Could you tell me what those devices were?
A No, ma'am.
Q Classified?
A Yes, ma'am.
Q Were those tests ever published?
A In the same report that I have referred to previously.
Q So there are the same types of problems with peer review of those types of tests; is that true?
A If you choose to call those problems, yes.
Q Couldn't a modern-day terrorist combine a commercial high explosive device with a thermal source designed to fire after penetration into the cask?
A I am not sure what sort of device you are talking about. If you are talking about one which would

penetrate the cask and then fire something into the cask afterwards, that's a bit more sophisticated than most terrorists have access to. When I say "most terrorists," I am excluding what are generally called to be national level terrorists, in other words, those who are backed by some government somewhere.

Q State-sponsored terrorists?

A Right.

Q But you agree that to certain types of terrorists the combination of those devices, thermal and penetrating devices, would be available?

A To be very honest, that is not something I've followed as of late, so I can't honestly comment on that. I can say that the scenario you described is very difficult to accomplish.

Q Aren't such combinations used in the antitank weaponry we just discussed, the type which was used in the Gulf War?

A What was used in the Gulf War is a projectile of uranium behind a shaped charge. The combination requires velocity on the part of the munition in order to be effective, in other words, it is not a stationary type of munition, you don't place it and fire it and have it work. It requires to be fired

damage to the fuel inside the cask?

A It might increase damage very slightly, but you are talking about a very large system and a very small pellet. It is inconceivable that you could introduce this flaming magnesium inside of the cask and not have it quenched by all of the cold surfaces that it meets there and very quickly would run out of steam or out of energy.

Q Wouldn't the heat in the presence of air cause reoxidation and dispersal of the spent fuel inside the cask?

A You are getting into a very technical area. When we did the test, penetrating a cask, the only fuel pins that were disrupted were those that were in the path of the jet that penetrated the cask. Likewise, if you entrain this flaming magnesium into that jet, those same pins would be the ones that were disrupted. Furthermore, the disruption occurs only over the diameter of the jet, which in the case of the cask we did was about a quarter of an inch.

There is some subsequent damage to surrounding pins from expansion, but that damage was not disrupt -- totally disruptive in damage, it bent pins and, in a few cases, it broke cladding. Even if you do that, the amount of uranium that would be

release of radioactive particles?

A The shattering and what, now? I am trying to think the thing through, what you just said.

Q Shattering and heating.

A And heating, okay. The heating would have little to do with it since the primary disruptive mechanism is the shock front from the explosive, and that would indeed shatter the spent fuel. It would also shatter fresh fuel.

I don't think there is any information available one way or the other as to whether the particle size distribution would be different, although the spent fuel is already fractured, whereas fresh fuel is not. So it is likely that there would be a particle size distribution difference. I just don't think you can determine whether it would be towards smaller particle sizes or larger particle sizes. Existing fractures would tend to disrupt your shock front and cause a different behavior.

Q And you just stated that spent fuel does have existing fractures; is that right?

A Oh, yes.

Q I would like you to take a look at your rebuttal, page 3, line 15, where you stated that the fresh

to pop open, couldn't there be a release from that opening as well?

MR. BRADLEY: Objection, lack of foundation. She hasn't established that it would.

MS. ZELLMER: No, I am just asking a hypothetical question, if it had.

MR. BRADLEY: Lack of foundation.

THE JUDGE: Do you have any basis for this other than sort of your own reasoning, I mean, is there tests somewhere where this has happened?

MS. ZELLMER: No. The tests that he is referring to aren't published, so there is no way for us to know whether the valve was open or closed or --

THE WITNESS: The tests I am referring to were published.

BY MS. ZELLMER:

Q The Sandia tests were published but classified, correct?

A No. The tests you are talking about, where we actually penetrated a cask using a shaped charge, those conducted in 1983 were published in the open literature.

THE JUDGE: I am going to sustain the objection with regard to the valve.

instrumentation that was involved. Everything possible about the test has been published.

Q Is that published in, like, a scientific journal or is it just published independently as PATRAM minutes or something like that?

A PATRAM is a peer-reviewed publication. It is a peer-reviewed meeting. All of the papers must go through a peer review before being presented.

Q A modern-day terrorist could use more than one commercial explosive on a single cask, couldn't they?

A Not very easily.

Q But they could, couldn't they?

A They would have to be quite sophisticated. In order to assure proper placement, proper geometry, you would have to have very accurate timing.

Q A modern-day terrorist certainly could use a second device and a timer, couldn't they?

A It depends on the capabilities of the terrorist. If you are talking about a state-supported terrorist, that's perhaps possible. If you are talking about the disgruntled employee or the Weathermen type terrorists, those kinds of timing devices simply aren't available.

Q But the answer is yes, that it is possible for

certain terrorists, true?

A For certain terrorists.

Q You, yourself, haven't tested any of the Transnuclear casks to determine whether drain valves or seals would hold up to high pressure and temperature once penetration is achieved, have you?

A No, I have not.

Q Mr. Jefferson, what have you done in the last five years to update your knowledge of explosives?

A Other than keeping up with the literature, I have not been directly involved in use or testing of explosives in the last five years.

Q What have you done in the last five years to update your knowledge of the capabilities of terrorists?

A The involvement that I have had in the last five years in that area is a matter that, while not classified, I have been asked not to talk about.

MR. BRADLEY: I don't want -- by NSP?

THE WITNESS: No, not by NSP.

MR. BRADLEY: Thank you.

THE WITNESS: From the State Department.

BY MS. ZELLMER:

Q If you can tell me, does this -- was this conducted in your role as an independent consultant on transportation issues?

A Not in the direct sense. I was approached by interests antagonistic to the United States and was asked by the State Department to play a role. That's all I am going to say about it.

Q Is it accurate to say, then, that your analysis of terrorism and explosives on spent fuel casks for NSP is based largely on your experiences at Sandia?

A That is correct.

Q And it is based largely on the early 1980's testing at Sandia, to be more specific; is that true?

A That is correct.

MS. ZELLMER: That's all I have at this time. Thank you, Mr. Jefferson.

THE JUDGE: All right. Coalition.

MR. CROCKER: Thank you, Your Honor.

CROSS EXAMINATION

BY MR. CROCKER:

Q Good morning, Mr. Jefferson.

A Good morning.

Q My name is George Crocker, and I have just a few questions for you this morning.

Were the tests that you conducted at Sandia, the tests that achieved penetration, did they penetrate casks that were pressurized?

A When you say plural, which tests are you talking

supplied by TN.

BY MR. CROCKER:

Q Can you give us some idea as to why that would be?

A Concrete is an easier material to fracture than steel.

Q Mr. Jefferson, do you have an opinion on what would be the most effective way to sabotage NSP's proposed casks?

A Yes.

Q What would be the optimum number on an attack team engaged in such an activity?

MR. BRADLEY: Mr. Jefferson, you know better than I what is classified, so I will have to rely on you.

THE WITNESS: You are leading me to the very edge of classification, and I am reluctant to step across it. Let's put it this way, it would be more than two.

BY MR. CROCKER:

Q Less than five?

A I am not going to comment any further.

THE JUDGE: Mr. Crocker, I will just tell you, I have some great discomfort trying to elicit on the record recommendations from an expert like this as to the best way to sabotage these things.

questions that you were asked by Ms. Zellmer and Mr. Crocker. In answering one of Ms. Zellmer's question you used the term "fracturing," and I think you meant spent fuel. Could you define what you mean by saying that the spent fuel is already fractured?

A During use in the reactor, the spent fuel pellets, the small individual fuel pellets themselves, do undergo some fracturing, some cracking as a result of the temperature swings during heat-up and cool-down cycles.

Q Okay. Following up on Mr. Crocker's question regarding the pressure in the cask, if you had several atmospheres of gas pressure inside the cask, would that cause material to come spewing out of a quarter-inch hole?

A It would cause, perhaps, a small amount of additional material to come spewing out the hole, but not a great deal, because it doesn't take a lot of gas exiting the hole to reduce the pressure in the cask to ambient again.

Q Would it be primarily the helium gas that would come out of the hole or would it carry some materials along with it?

A In the vicinity of the hole, those materials that

are already suspended in the gas as a result of the explosive attack would in all likelihood be expelled, but they might be expelled anyhow as a result of the additional pressure you put in the cask as a result of the penetration, so it is a wash. I am not sure it would create any more release or not.

Q Would there be some release of krypton 85?

A Again, that depends on a number of factors. I assume that if you breach the cladding, you then release all the krypton 85. That gas in the fuel pin itself is under pressure and so therefore it would expand into the cask volume and part of that would be expelled through the opening in the cask, if you were able to penetrate the cask.

MR. JACOBSON: Thank you. I think that's all we have.

THE JUDGE: I had one question. A couple of times now you have used the term "fuel pin." Is that the same as fuel rod?

THE WITNESS: Again, I am not sure how this hearing has been using the term "fuel rod." A fuel bundle or a fuel element is composed of a number of pins or rods. What I am talking to is the individual string of pellets in a single cladding.

Testimony

Because of NRC site requirements, NSP's proposed dry cask storage facility must fulfill many critical safety and security requirements.

Besides being vessels which must safely contain high-level radioactive waste for decades or longer, they must also be passive defensive systems. This is due to the limitations of the site and its inherent vulnerability.

When nuclear power plants are designed and constructed, serious consideration is given to the "hardness" of the reactor buildings and installations. Security for these installations have layers of redundancy. The reactor buildings have very thick reinforced concrete walls and ceilings. This is to contain any radioactive release that could occur from an accident inside the plant. It is also to keep the installation safe from acts of God--tornados--lightning--air plane crashes.

The thickness of the reinforced concrete is the main component of the security. Besides acts of God the walls are built thick to absorb the energy of a direct weapons hit. There are no windows in these buildings where any one from the outside can see or locate specific pieces of equipment. This makes accurate target acquisition very difficult. The thickness of the walls would absorb much of energy from a ATGW weapons strike. People on the inside of the building could be directly affected by this action but the amount of direct damage to equipment would be directly affected by the absorption of energy from the reinforced concrete walls and ceilings. The thickness of the buildings walls would directly affect the circular probability of error in relation to targeting a specific piece of equipment

perform this critical function. There is much documented evidence in the handout that would directly contradict these claims.

To be absolutely sure that the safety and security of NSP's dry cask storage facility can be maintained for decades certain critical documents and recommendations must be seriously reviewed. These documents and recommendations are explained in the hand out material.

Passive defensive systems have an inherent weakness. This weakness is their inability to adapt to different threat scenario's The technical advances of weapon systems, ballistic's and ordinance have increased exponentially, man transportable ATGW systems are a multi-billion dollar growing world wide market. This market and the abilities of these weapon systems is documented in the hand out material. Because of this and other geo-political factors, the ability for passive defensive systems to adapt is seriously limited.

It is most important that the evacuation radius in relation to dry cask storage facilities be properly accessed. It must be established what environmental damage would occur from the uncontrolled release of high-level radioactive material from a damaged TN-40 dry cask. Economic and political compromises must not be the first priority for NSP's dry cask storage site. The safety and security of the citizens of Minnesota and the environment they live in most be the only priority. The only security criteria that can be met at NSP's dry cask storage facility is the limited ability to react to an occurrence, by then it's too late.

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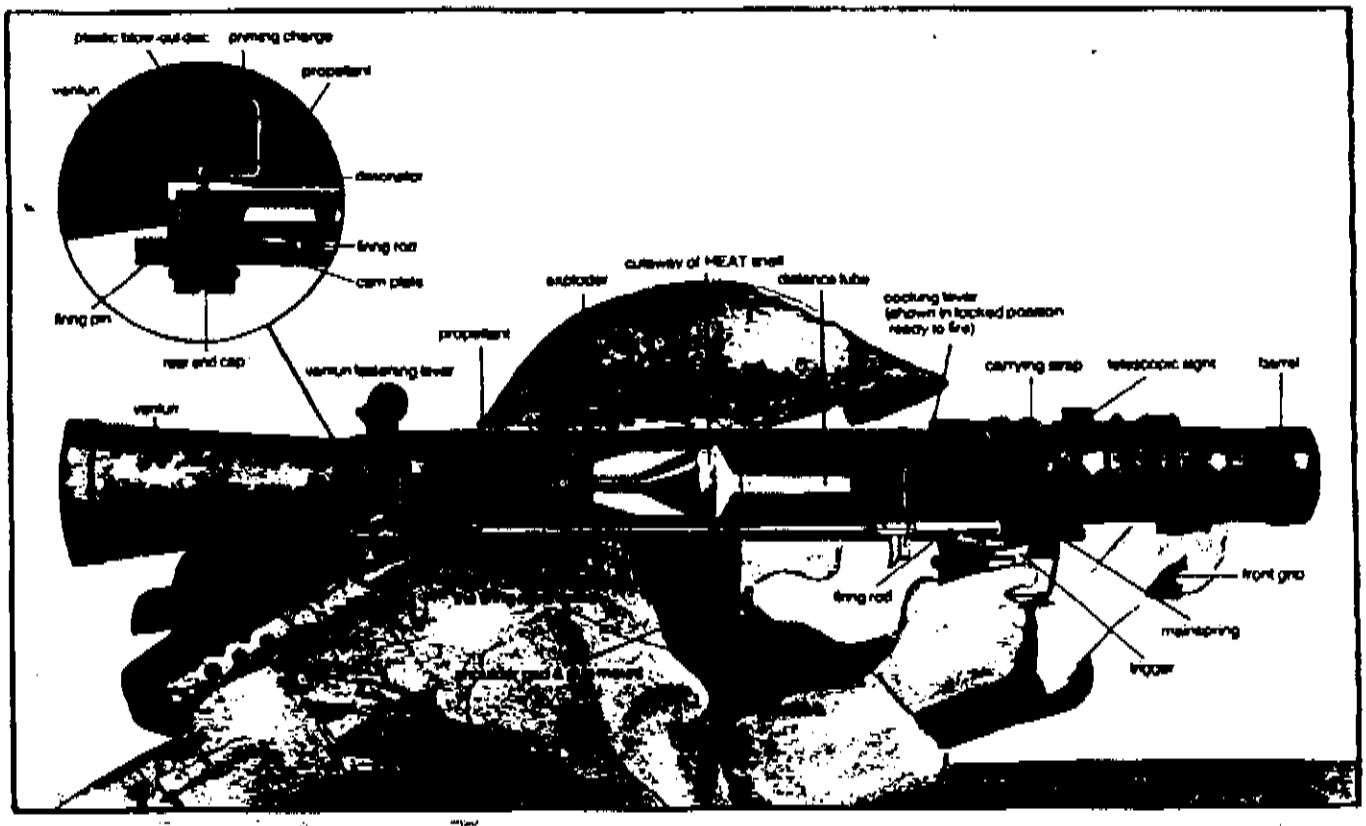

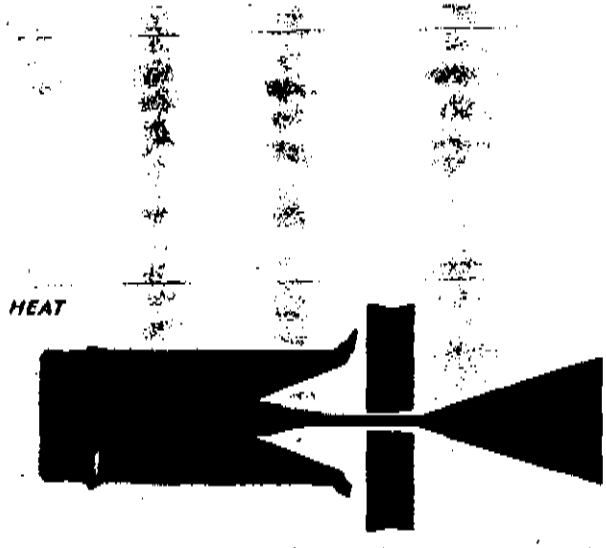

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	European Consortium		Milan ATGW
	USSR		AT-4 Spigot
Iran	Various		RPG-7V
	USA		DRAGON ATGW
	USA		TOW ATGW
			ENTAC ATGW
Libya	Various		RPG-7V
	Sweden		84mm Carl Gustaf
	UK		Swingfire ATGW
	USSR		Sagger ATGW
	USSR		AT-4Spigot
	USA		Tow ATGW
North Korea	Various		RPG-7V
	USSR		Snapper ATGW
	USSR		Sagger ATGW
Syria	Various		RPG-7
	USSR		Sagger ATGW
	USSR		Snapper ATGW
	USSR		AT-4 Spigot
	UK		HOT ATGW
Cuba	Various		RPG-7
	USSR		Sagger ATGW
	USSR		Snapper ATGW

NATION	MANUFACTURING COUNTRY	WEAPON TYPE
Serbia	Various	RPG-7
	USSR	Sagger ATGW
	USSR	Snapper ATGW
	USA	Dragon ATGW
	USA	Tow ATGW
Lebanon	Various	RPG-7
	European Consortium	Milan ATGW
	USA	Tow ATGW
Somalia	Various	RPG-7
	European Consortium	Milan ATGW
	USSR	Sagger ATGW