

**Micro-Chemical Explosive Residue and Blast
Damage Analysis Concerning the Events at the
Branch Davidian Complex in Waco Texas**

Prepared for the Office of Special Counsel

**Dr. Gerry Murray
Forensic Science Agency of Northern Ireland**

**Mr. David A. Green
Lake County Regional Forensic Laboratory (OH)**

Table of Contents

1.0 Introduction	3
1.1 Background	3
1.2 Issues	3
1.3 Documentary and Physical Evidence	3
1.4 Conclusion	4
2.0 Explosions and Explosives	4
3.0 History of the Concrete Bunker	5
4.0 Fire and Structural Damage to the Concrete Bunker	6
5.0 The Concrete Bunker	7
5.1 Condition of Bunker	7
5.2 Heat Damage to the Concrete Bunker	8
5.3 Size, Placement, and Use of a Shaped Charge	9
5.4 Autopsy Evidence	9
5.5 Laboratory Examination of the Reinforcing Bars	9
5.6 Laboratory Examination of Metal Grenade Fragments and Other Debris	10
5.7 Explosive Materials in the Compound	11
5.8 Conclusion	11
6.0 Ruptured Propane Tank	12
6.1 Condition of the Propane Tank	12
6.2 Laboratory Examination of the Propane Tank	12
6.3 Heat Damage to the Propane Tank	12
6.4 Conclusion	13
7.0 Conclusions	13
Appendix 1	14
Curriculum Vitae of Dr. Murray	15
Curriculum Vitae of Mr. Green	16
Appendix 2	18
Photographs referenced in the text	19

1.0 Introduction

1.1 Background

In December 1999, we were contacted by the Office of Special Counsel, and informed of the inquiry into allegations concerning the siege at the Branch Davidian complex in Waco, Texas in April 1993. These allegations included (a) that an explosive device, incorporating a shaped charge, had been initiated on the roof of the concrete “bunker” within the complex and (b) that explosives had been used to remove the neck of a large propane tank to reinforce the explosion and fire. The Forensic Science Agency agreed to review the explosives aspects of the inquiry and, if necessary, examine physical evidence for the presence of explosives residues. The Lake County Regional Forensic Laboratory, Ohio, agreed to perform all necessary on-site examinations of physical evidence.

1.2 Issues

(1) Did government agents use an explosive device to breach the concrete bunker at the Branch Davidian complex on April 19, 1993: (2) Did government agents use an explosive device to detonate the ruptured propane tank found amongst the debris of the Branch Davidian complex.

1.3 Documentary and Physical Evidence

(1) The Office of Special Counsel provided us with substantial documentation and photographs in relation to this matter. We received the material over the course of several months. The material included approximately three hundred fifty seven (357) photographs and six (6) videos, which show the complete compound before, during, and after the fire, the concrete bunker area after the fire, processing of the scene by law enforcement personnel, and the demolition of the concrete bunker. We were supplied with maps, floor plans and diagrams of the Branch Davidian complex. We were also supplied with numerous statements from witnesses, which include but are not limited to, law enforcement personnel, Branch Davidians, and experts from various scientific and medical disciplines.

(2) With the assistance of the Office of Special Counsel, The United States District Court for the Western District of Texas released into Dr. Murray’s custody lengths of reinforcing bar which were wrapped in tarpaulin together with control materials. The Office of Special Counsel informed us, that the reinforcing bar had been part of the roof structure of the concrete bunker.

Mr. Green was also granted permission to travel to the Court’s secured storage area to examine evidentiary items collected from the roof and inside the concrete bunker. Mr. Green and investigators from the Office of Special Counsel traveled to Waco, Texas, and examined the evidence collected from the Branch Davidian compound. Mr. Green used cotton tipped applicators soaked in methyl alcohol to “swab” four (4)

gas masks that were originally located inside the concrete bunker. Mr. Green also “swabbed” an empty propane tank which exhibited a large hole in one end. Mr. Green swabbed the area around the edge of the damaged portion of the propane tank. The collected swabs were mailed by Federal Express to Dr. Murray by Mr. Green on July 10, 2000.

Mr. Green also reviewed several suspected grenade parts and fragments, the remains of a number of gas masks, the remains of a number of assorted rounds of ammunition, together with a bible, and pieces of paper. These items all were labeled as having originated on the roof of the concrete bunker. These items were retrieved from the secured storage location at a later date and sent to Dr. Murray for laboratory examination by the Office of Special Counsel.

1.4 Conclusion

Based on our review of the documents, photos, physical evidence, and our micro-chemical analysis of residue taken from the concrete bunker reinforcement bars, the questioned propane tank, and debris inside and on top of the concrete bunker, we conclude that: (1) Government agents did not use a shaped charge or other high explosive type device to breach the concrete bunker at the Mount Carmel complex on April 19, 1993; and (2) Government agents did not use an explosive device to detonate the exploded propane tank found amongst the debris of the Mount Carmel complex.

2.0 Explosions and Explosives

Before dealing in detail with the specific issues submitted to the Forensic Science Agency and the Lake County Regional Forensic Lab by the Office of Special Counsel, it is important to consider briefly some of the concepts and terms used in explosives investigations.

An explosion may be defined as a sudden, rapid release of previously confined energy. This release is accompanied by those physical characteristics normally associated with an explosion namely loud noise, bright flash of light, heat and the physical movement of objects close to the seat of the explosion. There are essentially three categories of explosion, (1) mechanical explosion, (2) chemical explosion and (3) nuclear explosion. For the purpose of this report, only (1) and (2) will be considered.

A mechanical explosion occurs when a system under pressure finally disrupts. The simplest example of this is a child’s rubber balloon popping or a liquefied petroleum gas cylinder rupturing as a result of being subjected to a sustained, intense fire.

A chemical explosion results from a chemical reaction, but a reaction producing a high level of energy very fast. There are two types of chemical explosion, namely, dispersed explosions and condensed explosions. In a dispersed explosion, the reactants, usually in the form of a combustible gas and air, in suitable proportions, are dispersed within a

given volume. Introduction of an ignition will start the combustion process and the reaction will proceed rapidly, outwards from the point of ignition until the pressure build-up disrupts the structure confining the reactant mixture. This would be the scenario, for example, in a domestic gas explosion. The effects of such an explosion are maximized at points remote from the point of ignition. In a condensed explosion, the reactants (explosives) are in a “condensed”, frequently solid, form. Here, initiation of the explosive produces an energy release at a point source (seat of explosion) and the effects of the explosion diminish rapidly with distance from the seat of the explosion.

Within condensed explosives, there are “low order” and “high order” explosives. Low order explosives deflagrate (burn) and rely on confinement for effect. A typical example would be a pipe bomb type device or improvised hand grenade, initiated via a short length of igniferous fuse. High order explosives detonate a process whereby a shock wave travels through the explosive. High order explosives are characterised by very high energy release.

One of the allegations in the Office of Special Counsel investigation concerns the use of a “shaped charge” device. When a high order explosive charge is initiated, the effects of the explosion are experienced in all directions. This is not the case with a shaped charge. The shaped charge concept configures the explosive, usually by means of a metal cone, such that the explosive effects are “focused” towards a specific point. A simple, non-explosive, example is the focusing of the sun’s rays using a magnifying glass. The shaped charge effect is designed primarily to defeat substantial, particularly armoured, targets. The use of a shaped explosive charge placed directly on a target surface will produce a hole with a diameter approximating the diameter of the face of the charge.

3.0 History of the Concrete Bunker

The concrete bunker in the Branch Davidian Complex resided at the base of the four story central tower. It served as the first floor base of the tower with three floors built above it. The concrete bunker was constructed of reinforced concrete and exhibits one door, which served as both the entrance and exit. According to the statements of Branch Davidian Katherine Schroeder there was no door in the doorway. The concrete bunker was approximately 7.1 meters by 7.3 meters in area. The walls and roof are approximately 7 inches thick and exhibited two concrete support beams. According to Branch Davidians and Davidian historians the concrete bunker was built in the 1930’s. In 1980, the concrete bunker was involved in a fire which fellow Davidians claim may have been started by David Koresh, then known as Vernon Howell. The Branch Davidians used the concrete bunker as a weapons and ammunitions storage according to Davidians Graeme Craddock and Katherine Schroeder, this fact is also confirmed by photographs taken after the fire.

4.0 Fire and Structural Damage to the Concrete Bunker

Pictorial images, whether in video or still photography format, can prove to be a very valuable tool in assessing the development of an incident, such as that at Waco, particularly when used in combination with an on-site scene examination. The video tapes and photographs, provided to us by the Office of the Special Counsel, show a sequence of events before, during and after the intense fire at the Branch Davidian complex. At approximately 12:18 P.M. on April 19, 1993, the central tower over the concrete bunker collapsed. Shortly thereafter a bright flash is seen above the position of the concrete bunker, followed by a large fireball. The fireball is consistent with the ignition of a large quantity of flammable vapour.

There are various photographs of the concrete bunker roof, both from the outside and from within. One photograph depicts a roughly circular hole, with bent or bowed lengths of reinforcing bar clearly visible. Although the bars are deformed, there is no apparent evidence of high order explosion damage. Close to this hole is what appears to be the barrel of an M16 rifle, see Appendix 2, Figure 1. Using the distance from the front of the barrel to the front of the sight as a reference, we estimated the diameter for the hole to be approximately 47 centimeters. As observable in several of the photographs, it was necessary for law enforcement officials to reinforce the roof before removing the bodies and collecting evidence from inside the concrete bunker do the unsafe conditions of the roof. See Appendix 2, Figure 2, which depicts the reinforcing knuckles on the sagging reinforcement bars. This is not the only hole in the roof. Heat damage and sag have also opened up holes along the perimeter of the bunker roof, see Appendix 2, Figures 3, 4, 5 and 6.

We understand that Office of Special Counsel fire expert, Dr. Wickstrom, has determined that spalling significantly damaged the roof of the bunker. Photographs of the inside of the concrete bunker show areas of this spalling on the ceiling, one around the hole through the roof and another nearby, although there has been no penetration of the roof in the latter case, see Appendix 2, Figure 7.

The interior photographs also show a significant number of firearms in the concrete bunker, see Appendix 2, Figures 8. The photo in Appendix 2, Figure 9, shows the hole in the concrete bunker roof and, nearby, at approximately the 4 o'clock position, what appears to be a circular depression.

The FBI Laboratory report of 6 December 1993, addressed to Sargent Miller of the Texas Rangers, advises that "Damage to the outside top of the concrete roof of the bunker in Search Zone M is consistent with at least two seats of explosions". The roof of the concrete bunker was designated by law enforcement as search zone M.

The walls of the bunker exhibit numerous cracks to various joints and throughout all four walls. These cracks are documented in several photographs, see Appendix 2, Figures 10, 11, and 12. The bunker was levelled by law enforcement officials because of safety

reasons, and this too is exhibited in several photographs, see for example Appendix 2, Figure 15.

5.0 The Concrete Bunker

5.1 Condition of Bunker

The concrete bunker was constructed of what is reported to be 70 year old concrete, and has been exposed to at least 2 documented fires. The heat of the fires has caused the concrete to spall, as confirmed by Dr. Ulf Wickstrom, weakening the structure and leading to substantial cracking of the walls.

Branch Davidians have also informed the Office of Special Counsel there was no door over the opening to the concrete bunker. Under these conditions if a device was placed on the roof and detonated, some pressure damage would have occurred, but damage would also have occurred from vibrations on the surface area. However, after a careful review of the physical condition of the bunker we do not see the type of damage typically associated with a high explosive charge. More damage would be expected to the concrete bunker, if a device were detonated on a structure of this type and in this condition.

While it is our opinion that the 47 centimeter hole located in the roof of the concrete bunker does exhibit some characteristics consistent with a shaped charge, namely, the round shape of the hole, this is not determinative that a shaped charge created the opening. The condition of the concrete bunker must be taken into consideration. Dr. Ulf Wickstrom, a fire expert of the Office of Special Counsel, has stated that spalling (see section 5.2 of this report) caused the hole. Ronald E. Koester, an engineer for the Texas Department of Transportation Waco, Texas district, also stated that he believed the hole may have been caused by some type of heavy object, due to the spalling. Therefore, while it may be true that a shaped charge may cause a hole, with characteristics similar to the hole in question, the shape of the hole is not determinative of the cause of the hole.

The Office of the Special Counsel supplied us with calculations regarding the deepest incursion of the CEV's used at Branch Davidian Complex on April 19, 1993. We requested information to determine whether the CEV's could have contributed to the damage to the bunker or whether the CEV's could have been used as a tool to deliver a shaped charge to the top of the bunker. In data supplied to the OSC by VDS(UK), it was noted that at approximately 1149 hours a CEV moves forward into the Branch Davidian complex and incurs approximately 15 feet. This is the deepest penetration into the complex proximate to the concrete bunker. Based on the calculations supplied to us by the OSC the boom of the CEV would be approximately 17 feet short of the bunker roof. Consequently the CEV and its boom could not have been used to push debris over the bunker doors or been used to place a shaped charge on the bunker roof. It simply did not get close enough for that purpose. Moreover, even if the CEV had incurred far enough for the boom to reach the bunker roof, the boom is not manoeuvrable enough to

administer a shaped charge in the center of the bunker roof. It is simply a tactical and technical impossibility.

The Office of the Special Counsel has also supplied us with the Declaration of Benton K. Partin, B/G USAF (Ret.), in which Gen. Partin's states that, "the blast pressure inside the vault was sufficiently great to do major structural damage to the reinforced concrete vault shell". While this indeed is a possibility, it is not the only explanation for the structural damage. As discussed above age, materials, and prior fire exposure all contributed to the condition of the bunker. We disagree with Gen. Partin, as the damage to the bunker is inconsistent with the use of a shaped charge. It is our opinion that a concrete structure of that age and condition would have suffered more substantial damage if subjected to such a charge.

Gen. Partin also declares, "the vault's concrete roof damaged apparently from an explosive breaching charge that had been placed on the floor of the second floor, i.e., on top of the vault. The hole is typical of the damage you get with a breaching charge on a reinforced concrete." As stated above, we agree that the shape of the central hole is consistent with a shaped charge, any conclusion based on shape alone is unsubstantiated and unreliable.

Gen. Partin also declares, "a military tank penetrating the building in front of the vault. Its depth of penetration probably pushed debris from four walls, the kitchen and the passageway close to or against the only vault door". As stated above this did not occur in the complex, see Appendix 2, Figure 12. We disagree with Gen. Partin, as his assumption is not supported by the VDS(UK) mensuration calculations.

Finally, Gen. Partin in his declaration states, "the explosion process reveals that the first show of bright, white light from the explosion comes from the fourth floor window the left near the juncture of the front and left faces of the fourth floor walls." Gen. Partin is simply incorrect. Upon review of video supplied by the Office of Special Counsel, it is noted that the tower burnt down approximately seven minutes before the fire ball explosion is viewed, see Appendix 2, Figure 14.

5.2 Heat and Damage to the Concrete Bunker

As previously stated in this Report, an expert in the field of fire damage, Dr. Ulf Wickstrom, concluded that based on his review of "TV footage" and photographs, that the hole in the center of the concrete bunker roof was caused by spalling, due to fire damage. We find no evidence to suggest otherwise. We have, however, found evidence of one or more low explosive charges having detonated, which may have contributed to the damage to the roof of the concrete bunker and hastened the spalling phenomenon. These low explosive charges are discussed in section 5.7 below.

5.3 Size, Placement, and Use of a Shaped Charge

If a shaped charge had been detonated on the roof of the concrete bunker, the face diameter of the charge would by necessity approximate the diameter of the hole, 2 to 3 feet. (47 centimeters). This would represent a sizeable device, with serious implications for clandestine deployment. The initiation of such a device would require some form of electrical firing mechanism with time delay (or remote control), power and detonation facilities, none of which were recovered from the Branch Davidian complex debris. It is also likely that a substantial shaped charge would have caused more damage to the reinforcing bars than that observed.

A shaped charge must be orientated in a specific direction in order to function properly. This characteristic of a shaped charge makes it difficult to set up and use properly. Placement of this type of device would be a difficult task to perform without being noticed. As previously mentioned in this report, the boom of the CEV's did not reach the area of the concrete bunker, therefore, it would highly unlikely that this could be a possible means to deliver and set the charge. Furthermore, it would not be practical to just throw a shaped charge device into an area in hopes that it would land, set-up, and function properly. Therefore, it is the opinion of the examiners that it would have been extremely difficult, if not impossible, from a tactical and technical point of view to correctly set a shaped charge under the conditions present at the Branch Davidian complex on April 19, 1993.

5.4 Autopsy Evidence

The Office of Special Counsel also supplied us with copies of the Tarrant County Medical Examiners Office autopsies of the Branch Davidians that perished on April 19, 1993. These reports do not indicate any blast or explosive damage to the bodies. Office of Special Counsel forensic Pathologist, Dr. Michael Graham, has also found that none of the victims, suffered lung blast injury or high velocity impact injuries consistent with a high explosive detonation.

This is a significant finding, since persons within the concrete bunker, particularly in the area below the hole, see Appendix 2, figure 10, would have been subjected to blast damage from the explosion. If a shaped charge had detonated, the large amount of pressure caused by the explosion would cause damage to the occupant's lungs and injuries from the high velocity impact from concrete. Based on the absence of these characteristics, injuries on individuals found inside and on top of the bunker, i.e. proximate to any alleged explosion, and other details explained in this report, it is the opinion of the examiners that a shaped charge could not have been detonated.

5.5 Laboratory Examination of the Reinforcing Bars

In May 2000, the Office of Special Council acquired and provided to the Forensic

Science Agency, five twisted lengths of steel reinforcing bar taken from the roof the concrete bunker. The bars were shipped in wraps of blue tarpaulin, green cloth and nylon cloth, see Appendix 2, Figure 19. These bars were examined for the presence of material of a high explosive nature. No such materials were detected.

The detection of explosive residues on a surface is dependant upon a number of factors including the type of explosive, the degree of contact/exposure, the time which has elapsed since contact/ exposure, and the treatment of the surface prior to examination. Exposure to an intense fire can also have a dramatic influence on the recovery of explosive residues.

Materials such as nitroglycerine are quite volatile and will evaporate relatively quickly. High performance explosives, such as RDX or PETN, like that used in shaped charges, however, are non-volatile and can remain for long periods of time. Because traces of nitroglycerine were detected on the metal reinforcement bars, it is highly unlikely that traces of a high performance explosive, which deteriorate much slower, would not have survived as well. This is extremely suggestive that a high explosive was not used to breach the concrete bunker.

5.6 Laboratory Examination of Metal Grenade Fragments and Other Debris

A number of items, designated 1046, 1059, 1068, 1282, 1469, 1610 and 1631 were received for examination from the Office of Special Counsel.

Items 1068, 1610 and 1631 consisted of assorted metal items including fragments of grenade body (U.S. MK2 format), some as “multiple” sections, the remains of the top section of a grenade igniter set, the remains of rounds of small arms ammunition, and parts of magazine clips.

Two features were of particular significance in relation to the grenade remains. The physical appearance of the grenade body fragments indicated that the grenades had exploded. However, the size of the fragments, particularly the “multiple” sections, indicated that the grenades had contained a low order explosive, not a high performance explosive normally associated with combat grenades or a primary high explosive such as mercury fulminate, see Appendix 2, Figures 16 and 18. A number of the grenade fragments were examined for the presence of residues consistent with the use of a low order explosive. No significant residues, of any kind, were detected.

The second feature of significance was the remains of the grenade igniter set, see Appendix 2, Figure 18. The top section of the grenade igniter set contains a percussion cap and a spring-loaded striker. Prior to use, the striker is held back by a fly-off lever which is secured by a split pin/ring assembly, the pin being inserted through aligning holes in the top of the igniter set; the ends of the pin are splayed to prevent accidental removal of the pin. The pin must be removed before the fly-off lever can be ejected and the striker can hit the percussion cap. In the case of the igniter set, the striker had been

released. If a grenade, with the split pin in place, exploded, particularly if the explosive was a low order explosive, there would not be sufficient force to remove the split pin. Therefore, it appears that the igniter set in item 1610 had been deliberately activated. It is noted that Special Agent Ronald Knight stated that at approximately 1230 hours he heard what he thought were grenades exploding inside the Branch Davidian complex.

On May 24, 2000, while in Waco, Texas, Mr. Green also obtained sample swabs from four gas masks, see Appendix 2, Figure 17, originally recovered inside the concrete bunker, using the sampling technique previously discussed. These samples were collected because they were found in the area directly below the hole in the roof of the concrete bunker. These items were selected on the chance that they would contain any potential post blast residue due to their position near the hole. Mr. Green forwarded the samples, on July 10, 2000, to the Forensic Science Agency for examination, by Dr. Murray. The swabs were examined for the presence of material of an explosive nature. Nitroglycerine was detected on one of the swabs taken from one of the masks. The significance of the detection of nitroglycerine is minimized by the fact that nitroglycerine is present in small weapons ammunition. Countless numbers of spent rounds of ammunition were present inside and on top of the concrete bunker. The examiners therefore expected the detection of nitroglycerine.

A number of items, designated, items 1046, 1059 and 1469 consisting of the remains of a number of gas masks and filters were received from the Office of Special Counsel. These items were examined for the presence of material of an explosive nature. No residues were detected.

5.7 Explosive Materials in the Compound

In the December 6, 1993, FBI Laboratory report, to Sgt Miller of the Texas Rangers, a reference is made to the identification of nitroglycerine. Whilst nitroglycerine has been used as an ingredient of some commercial blasting explosives, as noted above, it is widely encountered as a constituent of many small arms ammunition propellant. The presence of firearms and ammunition in and on the "bunker" indicates that the nitroglycerine originated from small arms ammunition and not an explosive charge.

In the statements of Donald Bunds, several other Davidians, and law enforcement intelligence reports, it is alleged that the inhabitants of the Branch Davidian complex had purchased numerous dummy grenades, and had converted those to live grenades. Donald Bunds also states that the materials necessary to produce mercury fulminate were not only purchased, but also used. Mercury fulminate is considered to be a high explosive material, which has been used as an initiator for high explosive devices.

5.8 Conclusion

It is the opinion of the examiners that a shaped charge explosive was not used to breach the concrete bunker at the branch Davidian complex on April 19, 1993. This conclusion is based on the following evidence:

- (1) The physical history of the bunker, specifically age, and its prior involvement in 2 fires.
- (2) The heat damage caused by spalling, which caused weakening of the structure, including the characteristic cracking joints, holes, etc.
- (3) The observed damage to the roof of the concrete bunker is consistent with a small, low order explosion, or a number of closely associated explosions having occurred in conjunction with the physical condition of the structure.
- (4) The absence of residues of a high performance explosive on the reinforcing bar, whilst not conclusive, indicate that such an explosive had not been used.
- (5) The lack of damage to the bunker and the fact that the bunker would have exhibited much more damage had it been subjected to a shaped charge.
- (6) The lack of blast damage to those in the bunker.
- (7) The recovery of grenade fragments from the roof of the concrete bunker.
- (8) Statements from Branch Davidians that they had generated mercury fulminate
- (9) The fact that it would be difficult, if not impossible, from a tactical perspective to set a shaped charge under the condition present on April 19, 1993.
- (10) A shaped charge will create a hole which mirrors its own size, thus requiring an unusually large and difficult to place shaped charge to create the hole in question.

6.0 Ruptured Propane Tank

6.1 Condition of Propane Tank

In this section we address the second of the allegations we were charged to investigate whether an explosive had been used to detonate the exploded propane tank found amongst the debris of the Branch Davidian complex.

In June 2000, while in Waco, Texas, Mr. Green obtained sample swabs from the outer edge of the propane tank in question, see Appendix 2, Figures 20, 21, and 22, using the technique previously mentioned. Mr. Green then forwarded those samples on July 10, 2000, to the Forensic Science Agency for examination, by Dr. Murray.

6.2 Laboratory Examination of the Propane Tank

The cotton tip applicator swab sample collected by Mr. Green from the propane tank was examined for the presence of materials of an explosive nature. Dr. Murray did not detect any significant explosive residues on the swabs referred to as being from the propane tank.

6.3 Heat Damage to the Propane Tank

Office of Special Counsel gas dispersion expert, Dr. Jerry Haven, informed us that based upon his review of video, photographs, and analysis, he concluded that the propane tank in question was damaged by a phenomenon called a BLEVE. This phenomenon is caused by a build up of temperature and pressure inside the propane tank from the fire

that caused the tank to explode at its weakest point. The point is generally a welding seam located on the tank.

6.4 Conclusion

It is the opinion of the examiners that an explosive was not used to detonate the exploded propane tank found amongst the debris of the Branch Davidian complex on April 19, 1993. This conclusion is based on the following items;

- (1) The observed damage to the tank is being reported as being consistent with having been BLEVED
- (2) The absence of residues of a high performance explosive on the swabs taken from the tank, whilst not conclusive, indicate that such an explosive had not been used.

7.0 Conclusions

Based on our review of the photo and physical evidence and our micro-chemical analysis of residue taken from the concrete bunker reinforcement bars, the questioned propane tank, and debris inside and on top of the concrete bunker, we conclude that:

- (1) Government agents did not use a shaped charge high explosive device to breach the concrete bunker at the Mount Carmel complex on April 19, 1993; and
- (2) Government agents did not use an explosive device to detonate the exploded propane tank found amongst the debris of the Mount Carmel complex.

Appendix 1

Curriculum Vitae

Curriculum Vitae of Dr. Gerry Murray

I am a Bachelor of Science (Chemistry), Doctor of Philosophy (Analytical Chemistry), a Chartered Chemist, a Fellow of the Royal Society of Chemistry and a Principal Scientific Officer at the Forensic Science Agency of Northern Ireland.

In December 1973, I joined the Explosives Section of the Northern Ireland Forensic Science Laboratory (now the Forensic Science Agency of Northern Ireland) as a Scientific Officer. I was promoted to Higher Scientific Officer in July 1974, to Senior Scientific Officer in January 1978 and to Principal Scientific Officer in July 1989.

I have almost 27 years experience in forensic explosives investigation concerning all aspects of the terrorist use of explosives in Northern Ireland. This has involved examination of submitted casework materials, analysis of explosives, micro-chemical examinations in relation to explosives residues, examinations of scenes of explosions, many of which were major bombing incidents, evaluation of explosives and devices, preparation of reports and presentation of evidence in court in criminal and civil proceedings in Northern Ireland. I have also given evidence, in relation to terrorist cases, to courts in the Republic of Ireland, Germany and the United States of America and assisted the French authorities in relation to a find of terrorist material in that country.

From December 1995 to April 1997, I was a member of a United States Department of Justice panel set up by the Office of the Inspector General to investigate allegations of misconduct and improper practices within the FBI laboratory in Washington DC.

I have represented my laboratory at national and international conferences in the United Kingdom, the United States of America and France, speaking on various aspects of the terrorist bombing campaign. I have lectured, for a number of years, on forensic explosives investigation to the Higher National Certificate Police Studies course in Northern Ireland and have been involved in the training of Scenes of Crime Officers.

I was appointed an Officer of the Order of the British Empire (OBE) in 1994.

Curriculum Vitae of David A. Green

EDUCATION

Bachelor of Science, Ohio University, Athens, Ohio
Forensic Chemistry Major

PROFESSIONAL SEMINARS AND SCHOOLS

GC/FTIR seminar, Hewlett-Packard, Independence, Ohio (1988)
Homicide Investigation, Case Western Reserve Univ., Cleveland, Ohio (1989)
Polarized Light Microscopy, McCrone Research Institute, Chicago, Illinois (1989)
Marijuana Identification, Ohio Peace Officers Training Academy, London, Ohio (1990)
Forensic Microscopy, McCrone Research Institute, Chicago, Illinois (1990)
Chromatographic Methods in Forensic Science, FBI Academy, Quantico, Virginia (1990)
Glass Analysis, Hocking Technical College, Nelsonville, Ohio (1991)
GC Troubleshooting seminar, Hewlett-Packard, Independence, Ohio (1991)
Footwear and Tiretrack Identification, Illinois State Police Lab, Carbondale, Illinois (1991)
Introduction to Hairs and Fiber, FBI Academy, Quantico, Virginia (1992)
International Symposium on Forensic Toxicology, FBI Academy, Quantico, Virginia (1992)
Motor-Vehicle Lamp Examination, Northwest Traffic Institute, Dayton, Ohio (1993)
DEA Forensic Chemist seminar, DEA Special Research and Training, McLean, Virginia (1993)
Advanced Arson Accelerant Detection, BATF workshop, Cincinnati, Ohio (1994)
International Symposium on Shoeprints and Tiretracks, FBI Academy, Quantico, Virginia (1994)
Arson Investigation (level I), Ohio State Fire Marshall's Office, OPOTA, London, Ohio (1994)
Accelerant Detection, BATF workshop, Cleveland, Ohio (1994)
Explosive Analysis, MAFS workshop, Fairview Heights, Illinois (1995)
International Symposium on Arson Investigation, FBI, Fairfax, Virginia (1995)
Steroid Identification and Analysis, Ohio Peace Officers Training Academy, London, Ohio (1995)
International Symposium on Trace Evidence, FBI, San Antonio, Texas (1996)
Current Technologies in Glass Analysis, MAFS workshop, Dayton, Ohio (1996)
Hit & Run: The Accident Reconstructionist, MAFS workshop, Dayton, Ohio (1996)
Advanced Explosive Analysis, MAFS workshop, Mentor, Ohio (1997)
Instrumental Analysis of Explosives, FBI Academy, Quantico, Virginia (1997)
Microscopy: Paint Pigments, MAFS Workshop, McCrone School, Des Moines, Iowa (1997)
Industrial Trends in Paint and Glass, MAFS Workshop, Ann Arbor, MI (1998)
Post Blast Investigation, MAFS Workshop, Cape Girardeau, MI (1999)
Advanced Fire Debris Analysis, ATF, St. Petersburg, FLA (1999)

EMPLOYMENT HISTORY

June 1989-present

Lake County Regional Forensic Laboratory, Painesville, Ohio

Duties include: Powder and plant material examination, collection and examination of trace evidence material, blood alcohol determination, footwear and tiretrack examination, tool mark impression examination, examination of fire debris, photography, explosive analysis, and crime scene processing.

November 1989-June 1990

Southgate Medical Laboratory

Part time duties included: Urine and blood analysis for drugs and alcohol

ASSOCIATIONS AND MEMBERSHIPS

Member, Midwestern Association of Forensic Scientists
Member, American Academy of Forensic Science
Member, Association of Official Analytical Chemists
Member, International Association for Identification
Member, Canadian Identification Society
Member, Lake County Fire Investigation Unit
Member, Scientific Working Group for Materials Examination
Member, Technical Working Group for Fire and Explosive Examinations
Member, American Society of Testing Materials
Diplomate, American Board of Criminalist

PROFESSIONAL ACTIVITIES

Board Member At Large, 1997-98, MAFS
Training and Education Committee Chair, 1997-98, MAFS
Training and Education Committee member, 1995-97, MAFS
Recording Secretary, Glass Subgroup, 1996-present, SWGMAT
Trace Section Coordinator, 1998-99, MAFS
President Elect, 1999-present, MAFS
Membership Chairman, 1999-present, MAFS

Teaching and Lecturing Experience

Organized numerous professional workshops
Instructed numerous courses for local law enforcement agencies
Lectured for Lakeland Community College on several occasions
Lectured for Ohio Peace Officers Training Academy
Lectured for Ohio State Highway Patrol Academy
Lectured to numerous civic groups, schools, and government agencies

Testified in the following courts

Ashtabula County Common Pleas Court
Lake County Common Pleas Court
Geauga County Common Pleas Court
Cuyahoga County Common Pleas Court
Mahoning County Common Pleas Court
Mentor Municipal Court
Willoughby Municipal Court
Painesville Municipal Court
Shaker Heights Municipal Court
Lyndhurst Municipal Court
South Euclid Municipal Court
Lake County Juvenile Court
Akron Federal Court
Cleveland Federal Court

Appendix 2

Photographs Referenced in Text



Figure 1: The above photograph depicts the questioned hole in the roof of the concrete bunker. Notice the four(4) u-bolts used on the reinforcement bars for safety precautions and the bowing of the reinforcement bars



Figure 2: The above photograph depicts the circular hole in question. Note the shape of the hole, and the reinforcement of the metal bars.



Figure 3: The above photograph depicts the circular hole located in the center of the bunker as well as several other hole located in the roof and their proximity to one another.



Figure 4: The above photograph depicts holes located in the roof of the concrete bunker. These holes occurred at the edge of the roof, several feet from the circular hole located in the center of the bunker roof (which can also be observed in figure 3).



Figure 5: The above photograph depicts the ceiling region inside the bunker. Note the pieces of concrete missing, due in part to the spalling phenomenon. Also note that several large holes are present in the ceiling, not just a single circular hole in the center area of the roof.

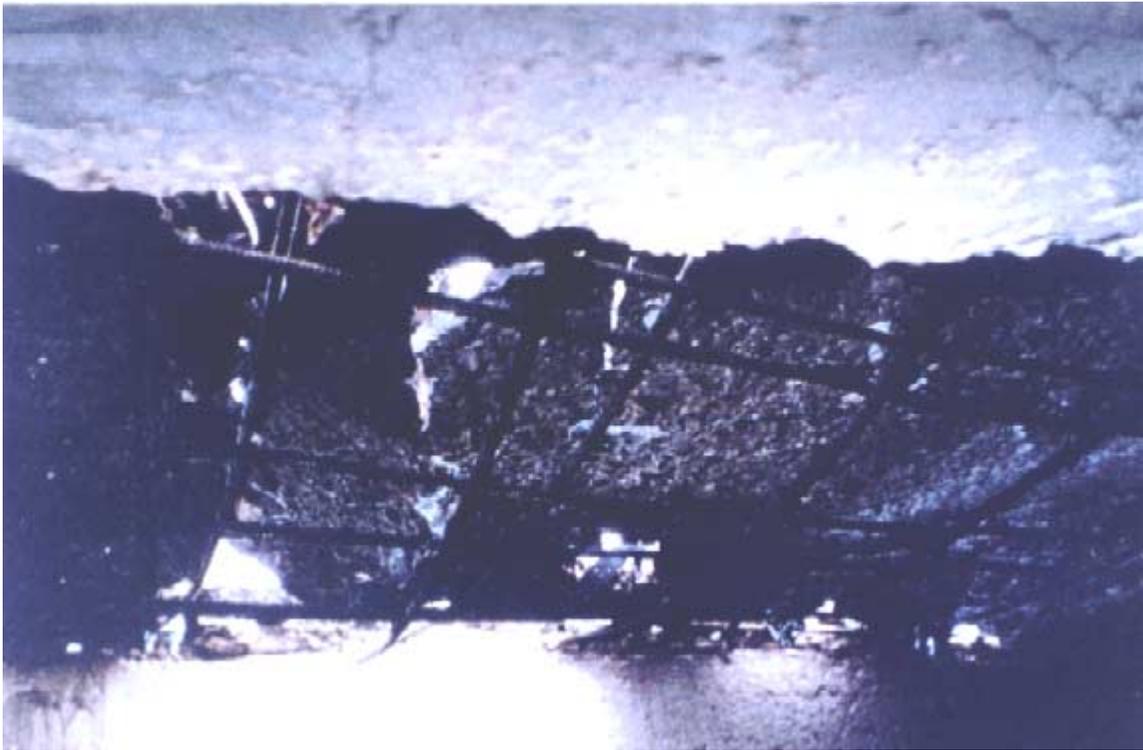


Figure 6: The above photograph depicts the ceiling region inside the bunker. Note the pieces of concrete missing, due in part to the spalling phenomenon. Also note that several holes are present in the ceiling, not just single circular hole in the center area of the roof.



Figure 7: The above photograph depicts the extreme damage to the concrete on the ceiling of the bunker. Notice the “bowing of the ceiling and the pieces of concrete missing from the underside of the reinforcement bars.

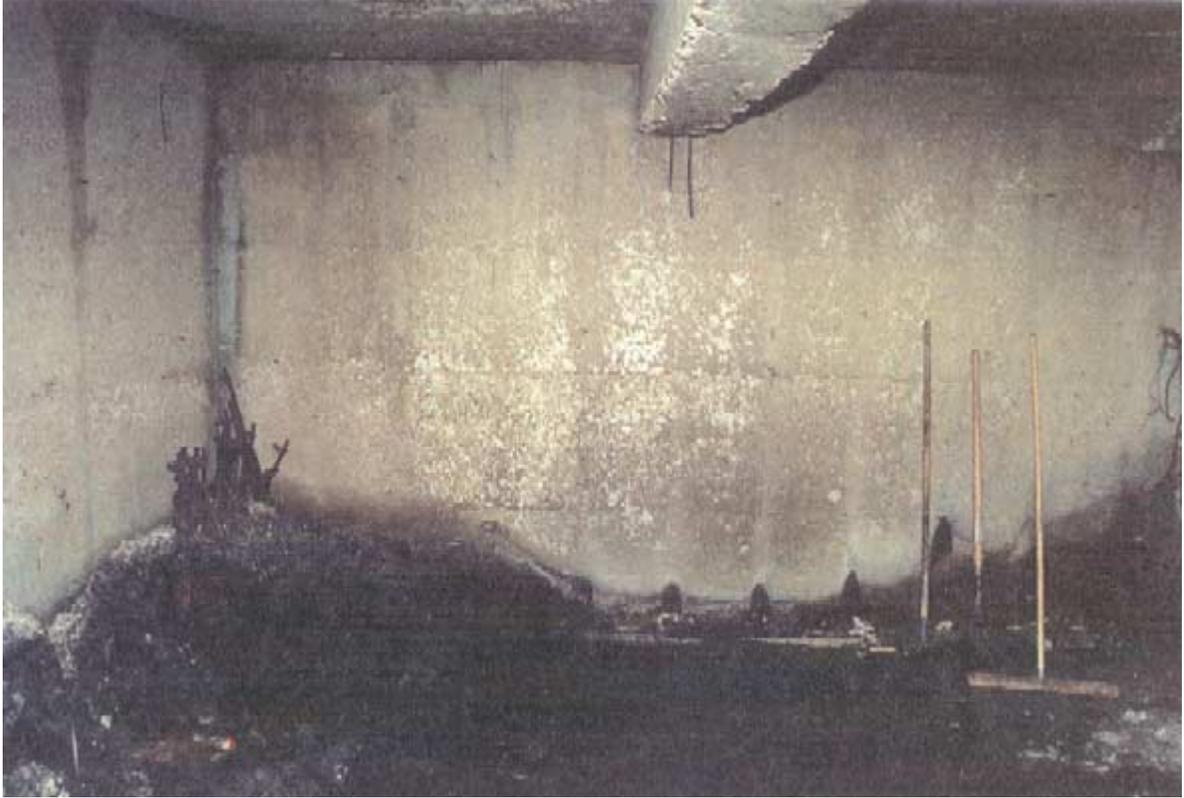


Figure 8: The above photograph again depicts the condition of the inside of the concrete, which constructed the bunker. Notice the pitting (missing pieces) on the concrete walls as well as the concrete beam in the ceiling.



Figure 9: The above photograph depicts the overhead view of the concrete bunker. Notice the hole in the “center” of the bunker, along with the second circular mark at the 4 o’clock area.



Figure 10: The above photograph depicts the front and side of the concrete bunker. Note the condition of the walls of the structure, specifically, the cracks and pitted areas located all over the outside walls.



Figure 11: This photo depicts the back of the concrete bunker, note the condition of the concrete on the walls, with regard to cracks and pitting.



Figure 12: The above photo depicts the condition of the concrete bunker from the front side. Notice the cracks and pitting on the outside surface. There is enough space in front of the doorway to allow several men to work.



Figure 13: The photograph depicts the inside of the concrete bunker. Note the “bowing” of the concrete ceiling, the pitting or spalling of the concrete ceiling beams, the condition of the metal object along the wall. Notice the metal object, or cooler, is not directly under the hole in the center of the bunker roof.

TOWER COLLAPSE AND PROPANE TANK EXPLOSION (ELAPSED TIME IN SECONDS)



00:00:00



00:09:00



00:10:50



07:58:56



07:58:56



07:58:99

Figure 14: The above series of photographs depicts still photographs created from video. The first frame exhibits the tower collapsing, from the fire, the next three frames depicts the fire burning as time elapses to the 7 minute 58 second mark, when a fireball explosion can be observed.



Figure 15: The photograph depicts the destruction of the concrete bunker. According to statements this was conducted due to the visibly and physically unsafe nature of the bunkers condition.



Figure 16: This photograph depicts pieces of grenade fragments which were collected from the roof of the concrete bunker.



Figure 17: This photograph depicts the masks that were “swabbed” by Mr. Green. The masks were labelled as having been collected from inside the bunker.



Figure 18: The lower photograph depicts a close view of grenade fragment. The top photograph depicts the grenade igniter set referenced in section 5.6 of this report.



Figure 19: This photograph depicts the reinforcement bars, which were tested for the presence of explosive residues.



Figure 20: The above photograph exhibits a view of the damaged edge of the questioned propane tank.



Figure 21: The above photograph depicts a close view of the edge of the questioned propane tank. This area was the region that was “swabbed” by Mr. Green.

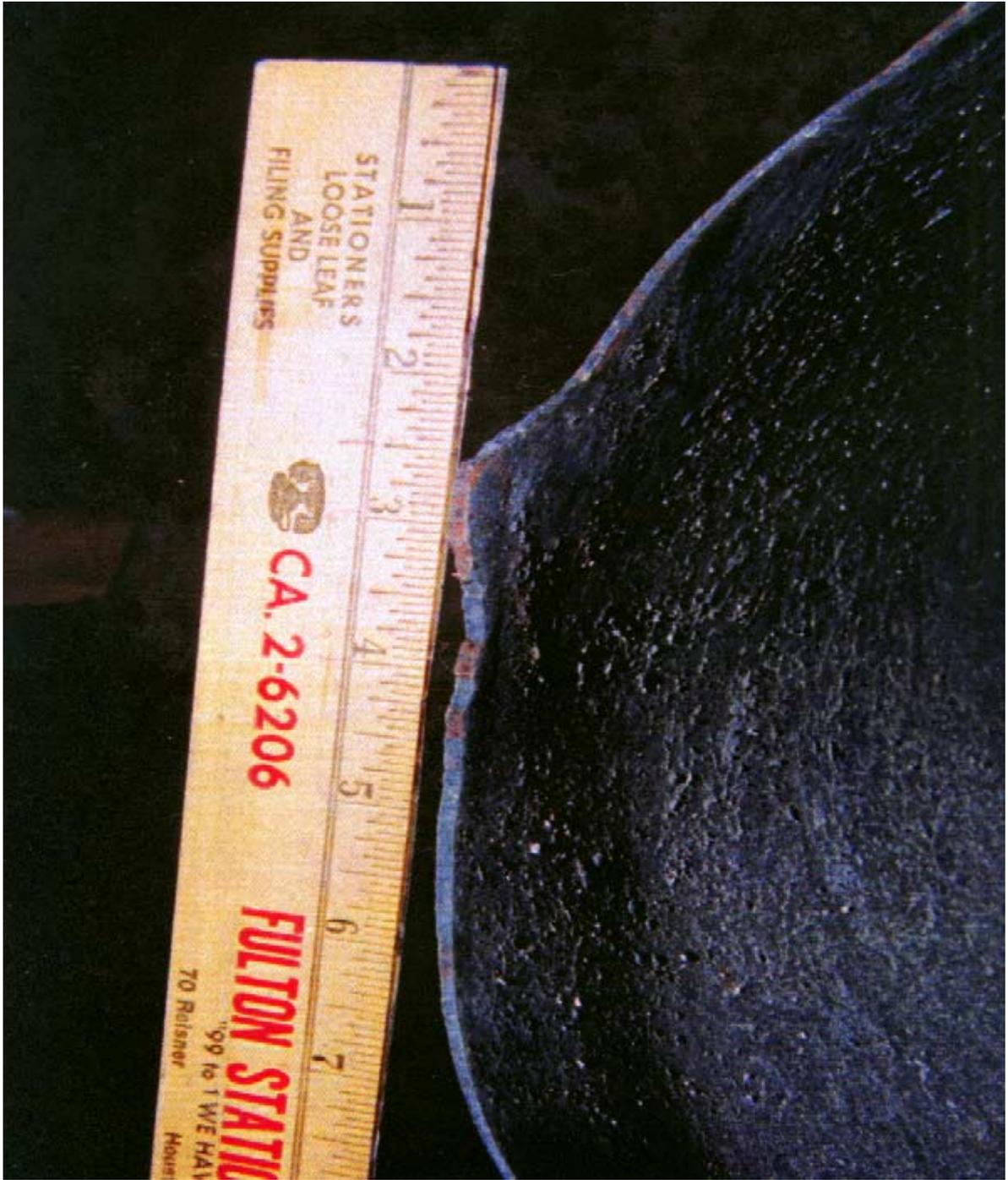


Figure 22: The above photograph depicts a close view of the edge of the propane tank