Final Report June 1999

Type A
Accident Investigation Board Report
of the April 19, 1999
Special Agent Fatality
at the
Southeast Courier Section
Oak Ridge, Tennessee

Albuquerque Operations Office

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Albuquerque Operations Office
U.S. Department of Energy

This report is a product of an Accident Investigation Board appointed by R. E. Glass, Manager, Albuquerque Operations Office, Department of Energy, as delegated by EH-1.

The Board was appointed to perform a Type A Investigation of this accident and to prepare an investigation report in accordance with DOE Order 225.1A, *Accident Investigations.*

The discussion of facts, as determined by the Board, and the views expressed in this report do not assume and are not intended to establish the existence of any duty at law on the part of the U.S. Government, its employees or agents, contractors, their employees or agents, or subcontractors at any tier, or any other party.

This report neither determines nor implies any legal liability.

On April 22, 1999, I established a Type A Accident Investigation Board to investigate the death of a Special Agent at the Southeast Courier Section located in Oak Ridge, Tennessee.

The Board's responsibilities have been completed with respect to this investigation. The analysis process; identification of direct, contributing and root causes; and development of judgments of need during the investigation were done in accordance with DOE Order 225.1A, *Accident Investigations*.

I accept the findings of the Board and authorize the release of this report for general distribution.

R. E. Glass
Manager
Albuquerque Operations Office

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

AED	Automatic Electronic Defibrillator
AL	Albuquerque Operations Office
BMI	Body Mass Index
BVM	Bag Valve Mask
CAIRS	Computerized Accident/Incident Reporting System
CFR	Code of Federal Regulations
CPR	Cardiopulmonary Resuscitation
CVD	Cardiovascular Disease
DOE	United States Department of Energy
EKG	Electrocardiogram
EMP	Emergency Management Program
EMT	Emergency Medical Technician
EH	DOE Office of Environment, Safety and Health
HDL	High Density Lipids
ISMS	Integrated Safety Management System
IV	Intravenous Drip
MOU	Memorandum of Understanding
NTS	Nevada Test Site
OR	Oak Ridge Operations Office
ORPS	Occurrence Reporting and Processing System
PAP	Personnel Assurance Program
PCS	Pantex Courier Section
SCS	Southeast Courier Section
SNL/NM	Sandia National Laboratories/New Mexico
SOMD	Site Occupational Medical Director
SPO	Security Police Officer
ST	Refers to a specific segment of the electrocardiogram
TR	Training Relief
TSD	Transportation Safeguards Division

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EXECUTIVE SUMMARY

INTRODUCTION

On April 19, 1999, a fatality occurred at the Albuquerque Operations Office (AL) Southeast Courier Section (SCS). A Special Agent had finished his 1-mile qualification run on a treadmill, walked out of the building and suffered an acute myocardial infarction resulting in death. The Assistant Secretary for the Office of Environment, Safety and Health (EH) delegated the responsibility for conducting a Type A accident investigation to the AL Manager on April 20, 1999. The AL Manager appointed a Type A Accident Investigation Board. The Board arrived at the Southeast Courier Section and began its investigation on April 21, 1999. The Board was chartered to review the accident and to determine the causes of the accident in accordance with Department of Energy (DOE) Order 225.1A, *Accident Investigations*.

In conducting this Type A investigation, the Board used various analytical techniques including barrier analysis, change analysis, and event and causal factors analysis. The Board inspected and photographed the accident site, reviewed events surrounding the accident, and conducted extensive interviews and document reviews to determine the factors that contributed to the accident. Relevant management systems were evaluated in accordance with the Order 225.1A, and against the five safety management functions of Integrated Safety Management.

ACCIDENT DESCRIPTION

Special Agent #1 had successfully completed a 1-mile qualification run on a Trotter 585 treadmill located in Building 9983-88. An Exercise Physiologist and another Special Agent (Special Agent #2) serving as a Safety Monitor were with Special Agent #1 during the qualification run. Neither the Exercise Physiologist nor Special Agent #2 noticed anything unusual. After the qualification run, Special Agent #1 left the building through the North exit with the Exercise Physiologist and Special Agent #2. At approximately 8:50 a.m., as Special Agent #1 reached the bottom of the stairs he suffered an acute myocardial infarction. The Exercise Physiologist and Special Agent #2 assisted Special Agent #1 to the ground. Special Agent #2 went back inside Building 9983-88 and dialed 911. The 911 call was received by Y-12 site emergency staff and Emergency Medical Technicians (EMTs) were dispatched at 8:51 a.m. The EMTs arrived at the SCS at 8:55 a.m. Appropriate on-site emergency medical care, including the use of an Automatic Electronic Defibrillator (AED), was administered to Special Agent #1 and he was transported to the hospital by ambulance at 9:11 a.m. The ambulance arrived at Methodist Medical Center in Oak Ridge, Tennessee at 9:17 a.m. Special Agent # 1 was pronounced dead a short time later.

An autopsy was conducted at the request of Special Agent #1's spouse. The Board has obtained a copy of the official *Certificate of Death*. The certificate was filled out by the forensic pathologist who conducted the autopsy and lists the cause of death identified in the autopsy.

CAUSAL FACTORS

Based on the *Certificate of Death* obtained by the Board, the Board identified the direct cause of the accident as an acute myocardial infarction suffered by Special Agent #1, with a secondary

cause of a coronary occlusion of the left anterior descending coronary artery, and coronary artery disease. Cardiovascular disease (CVD), including heart disease and stroke, affects approximately 57 million Americans, and is the direct cause of 42% of all deaths in the United States (Centers for Disease Control, 1999). Although this type of cardiac event can happen anywhere and under a variety of circumstances, the Board reviewed related Transportation Safeguards Division (TSD) programs, such as the medical and physical fitness programs. Weaknesses identified by the Board formed the basis for the causal factors, conclusions, and judgments of need identified below.

The root cause identified by the Board was a lack of effective integration and acceptance of suggestions and lessons learned within TSD.

The Board identified the following contributing causes of this accident:

- TSD Medical Program does not track non-Personnel Assurance Program (PAP) findings and medical records do not highlight historical issues.
- Recommendations to improve the Physical Fitness Program have not been implemented.
- Hazard analysis of Special Agent qualification processes has not been rigorously accomplished.
- TSD has not developed a lessons learned program.
- Oversight of the completeness and effectiveness of TSD Medical and Physical Fitness Programs has not been conducted.

The Board also identified that formal emergency response mechanisms have not been completed by TSD. Although this was not identified as a contributing cause to the accident, the Board identified this item as needing improvement.

CONCLUSIONS AND JUDGMENTS OF NEED

Table ES-1 presents the Board's Conclusions and Judgments of Need. The Board's Conclusions are those considered significant, based upon facts and pertinent analytical results. From the Conclusions, the Board developed Judgments of Need to guide managers in developing follow-up actions. Follow-up actions should include managerial, administrative, and safety management controls and practices necessary to resolve the conditions identified in the Conclusions for each Judgment of Need.

Table ES-1: Conclusions and Judgments of Need

Conclusions	Judgments of Need
• The TSD Medical Program has experienced numerous changes over the past five years and is still unstable due to the recent contractual change in April 1999. • Designated Physicians and cardiologists performing annual Special Agent examinations have rotated. • The Site Occupational Medical Director (SOMD) has changed four times since March 1998. • Several contract/subcontract changes have occurred in the past two years. • Ownership, roles, responsibilities, and relationships for Medical Programs are not well defined. • The medical contract evaluation for 1998 and 1999 indicated that the SOMD did not understand his roles and responsibilities. • The process for tracking and follow-up of individual medical issues that are not PAP requirements is informal and inconsistent, and does not include a Case Manager with a medical background. • The official occupational medical files and information are transferred between many physicians (Designated Physicians, cardiologists, SOMD) and completeness of the medical record is not assured. • A "problem list" of historical medical issues is not available to assist with continuity of follow-up. • The medical risks and stresses associated with TSD operations, particularly those relating to the Physical Fitness Program, are not effectively evaluated. • Medical qualification standards were developed in 1981 and have not been reevaluated to ensure that they are current.	• **TSD needs to implement a Medical Program that includes clear roles and responsibilities, processes for evaluating medical risks and stresses, and a tracking system to follow-up on medical issues.** • **DOE/EH needs to evaluate medical qualification standards for consistency with current medical practices and physical fitness standards.**

Conclusions	Judgments of Need
• TSD Physical Fitness Standards were established in the early 1980s and do not reflect the most current studies and medical information available. • The present voluntary physical fitness evaluation process does not effectively maintain the physical readiness of an aging Special Agent cohort. • The Cooper Study and other study recommendations have not been implemented. • The Medical Program and the Exercise Physiologists are at the preliminary stage of interacting to ensure the continual physical readiness of Special Agents. • An irregular and unmonitored exercise program, travel and training requirements, limited windows of opportunity to qualify and potential loss of PAP Certification and overtime pay, are factors inherent in the job of the Special Agents. • There is no TSD requirement to ensure that medical exams are performed within 30 days of qualification runs and of participation in Physical Fitness Rehabilitation Programs. • Due to the TSD mission, Special Agents need to maintain a year-round level of fitness that will enable them to meet their Physical Qualification Standards at any time.	**TSD needs to implement an integrated Physical Fitness Maintenance Program and current Physical Fitness Qualification Standards.**
• Emergency notification and response to this accident was timely and appropriate. • The recording capability of the AED used at SCS was not functional because of a Y-12 security policy. • Oxygen availability requirements are inconsistent. (not required to be available for treadmill qualifications, but required for qualification runs at the track and Melton Hill Dam) • No medical authorization is available to administer oxygen at any courier section. • TSD has effectively planned for high	**TSD needs to ensure that site-specific Emergency Response Plans are available and current, clearly identify specific equipment and personnel qualification needs, and are periodically exercised, as written.**

Conclusions	Judgments of Need
consequence accident scenarios. • The TSD Emergency Response Plan at the local Courier Sections is not consistently managed or executed. • The recent SCS emergency response exercise at Melton Hill Dam did not follow the established Emergency Response Plan and did not involve emergency responders external to TSD. • Emergency response equipment and personnel qualification requirements are not evaluated for consistency. • A needs analysis for local emergency response has not been performed.	
• Assessments of hazards associated with the TSD Medical and Physical Fitness Programs have been performed with limited scope efforts and internal resources. • The current TSD Physical Fitness Improvement Team is working under a limited charter and considers medical requirements outside of their scope. • Medical personnel were not involved in assessing the risks or benefits associated with using a treadmill for TSD physical fitness qualification runs. • Employee concerns regarding the Physical Fitness and Medical Programs have not been fully addressed. • The 1995 employee concern about the 85% versus 100% stress test results and qualification runs is not fully addressed. The current SOMD suggested that an expert cardiology panel may be needed. • TSD has not addressed Integrated Safety Management System principles in the development and implementation of Physical Fitness Program requirements. • TSD has not effectively used outside experts and technical basis documentation. • Implementation of hazard analysis results has not occurred in a timely manner.	**TSD needs to implement a Hazard Analysis process.**

Conclusions	Judgments of Need
• There is no formal process in TSD for evaluating, responding to or learning from the findings of relevant accident investigations, external program reviews or internal program assessments, or employee concerns. • Three out of the seven commitments made by TSD in 1996 in response to the Type A Investigation of the Fatality of a Pantex Plant Security Police Officer have not been met. • It cannot be determined whether the recommendations made in a 1991 Computerized Accident/Incident Reporting System report involving a Special Agent in the TSD rehabilitation program were assessed or implemented by TSD. • TSD has not implemented feedback and continuous improvement Integrated Safety Management principles that facilitate the effective evaluation, response and implementation of corrective action or improvements to TSD programs and operations.	**TSD needs to develop and implement a formal Lessons Learned Program.**
• There is no record of external evaluation or oversight of TSD's Medical Program and Physical Fitness Program. • TSD has not performed the periodic assessments required by the emergency response portion of the Memorandum of Understanding between AL and Oak Ridge Operations Office. • There is no formal and rigorous process for self-assessment that evaluates effectiveness and adequacy of the medical program. • TSD has not utilized outside expertise to implement and assess the effectiveness of the Medical and Physical Fitness Programs.	• **TSD needs to establish a self-assessment process that evaluates the performance and effectiveness of the Medical, Physical Fitness and Emergency Response Programs.** • **DOE/Headquarters and AL need to periodically assess the Medical, Physical Fitness and Emergency Response Programs.**

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1. INTRODUCTION

1.1 BACKGROUND

On Monday, April 19, 1999, at approximately 8:50 a.m., a Special Agent (Special Agent #1) assigned to the Transportation Safeguards Division (TSD) Southeast Courier Section collapsed and subsequently died after completing a physical fitness qualification run.

On April 19, 1999, Special Agent #1 collapsed and died after completing a physical fitness qualification run.

The accident was reported to the Occurrence Reporting Processing System (ORPS) on April 19, 1999 [Occurrence Report Number: TEMP-NR-002]. The notification report was submitted to ORPS on May 5, 1999, as ALO--GOAL-TSS-1999-0001. (See Appendix A)

On April 20, 1999, the Assistant Secretary for the Office of Environment, Safety and Health (EH) delegated the responsibility for conducting the Type A Accident Investigation to the Manager of the Albuquerque Operations Office (AL).

The Manager, AL then established a Type A Accident Investigation Board to investigate the accident in accordance with Department of Energy (DOE) Order 225.1A, *Accident Investigations.*

The Board arrived on-site, examined the accident scene and began interviews on Wednesday, April 21, 1999. The memorandum formally establishing the Board was signed on Thursday, April 22, 1999.

The Board began its on-site investigation on April 21, 1999.

The appointment memoranda are located in Appendix B.

1.2 TSD MISSION AND SPECIAL AGENT TRAINING

The Transportation Safeguards Division's mission is to safely and securely transport government-owned nuclear weapons and special nuclear materials within the continental United States. Management, control and direction of TSD is centralized at AL Headquarters, Albuquerque, New Mexico. The Federal Officers who drive the transport and escort vehicles are Nuclear Materials Couriers (Special

Agents). TSD operates three courier sections located at Amarillo, Texas; Oak Ridge, Tennessee; and Albuquerque, New Mexico.

Special agents must pass periodic firearms, physical fitness, medical, and driving proficiency qualification requirements. Quarterly firearms qualification tests include technical and safety proficiency. The DOE Personnel Assurance Program (PAP) requires Special Agents to undergo a battery of medical/psychological exams, complete physical qualification runs quarterly, firearms and other training, and meet general reliability requirements for continued Certification. DOE also requires Special Agents to be part of a random drug and alcohol-testing program. A Special Agent failing to meet any of the minimum requirements necessary for Certification is removed from active status until the requirements are satisfied. The Special Agents receive overtime while on the road and this additional compensation supplements their income. The average age of the Special Agents is 43 years. The age distribution for the three courier sections is provided in Figure 1-1.

Special agents fulfill a critical mission of transporting Special Nuclear Materials and are required to complete rigorous training and medical requirements.

1.3 FACILITY DESCRIPTION

The Southeast Courier Section (SCS) is located on the Y-12 Site in Oak Ridge, Tennessee. The main TSD facilities at the SCS are shown in Figure 1-2.

SCS is located on the Y-12 Site in Oak Ridge, Tennessee.

Building 9107 is the main administrative facility with conference areas, storage lockers, weight training and exercise facilities and a waiting area for trip staging. Building 9983-88 contains the offices of the Exercise Physiologist and the Training Specialist as well as a computer assisted training center. Room 201 contains a Trotter 585 treadmill and weight scale. The treadmill is used for exercise requirements and is an optional method for fulfilling the qualification requirements of the 8-minute mile. Room 206 is a padded area for practicing weaponless self-defense skills and Room 207 has an interactive video simulator for practicing tactical responses. A diagram of Building 9983-88 is provided in Figure 1-3.

The SCS also uses the Melton Hill Dam with a straight 1-mile run and the Oak Ridge High School track for outdoor 1-mile and ¼-mile qualification runs. Various other exercise facilities in the Oak Ridge area are used for running, swimming, racquetball, tennis, basketball and bicycling as authorized off-site physical fitness activities.

1.4 SCOPE, PURPOSE, AND METHODOLOGY

The Board began its investigation on April 21, 1999, and submitted its draft report to the AL Manager on May 24, 1999. The final report was accepted by the AL Manager on June 1, 1999.

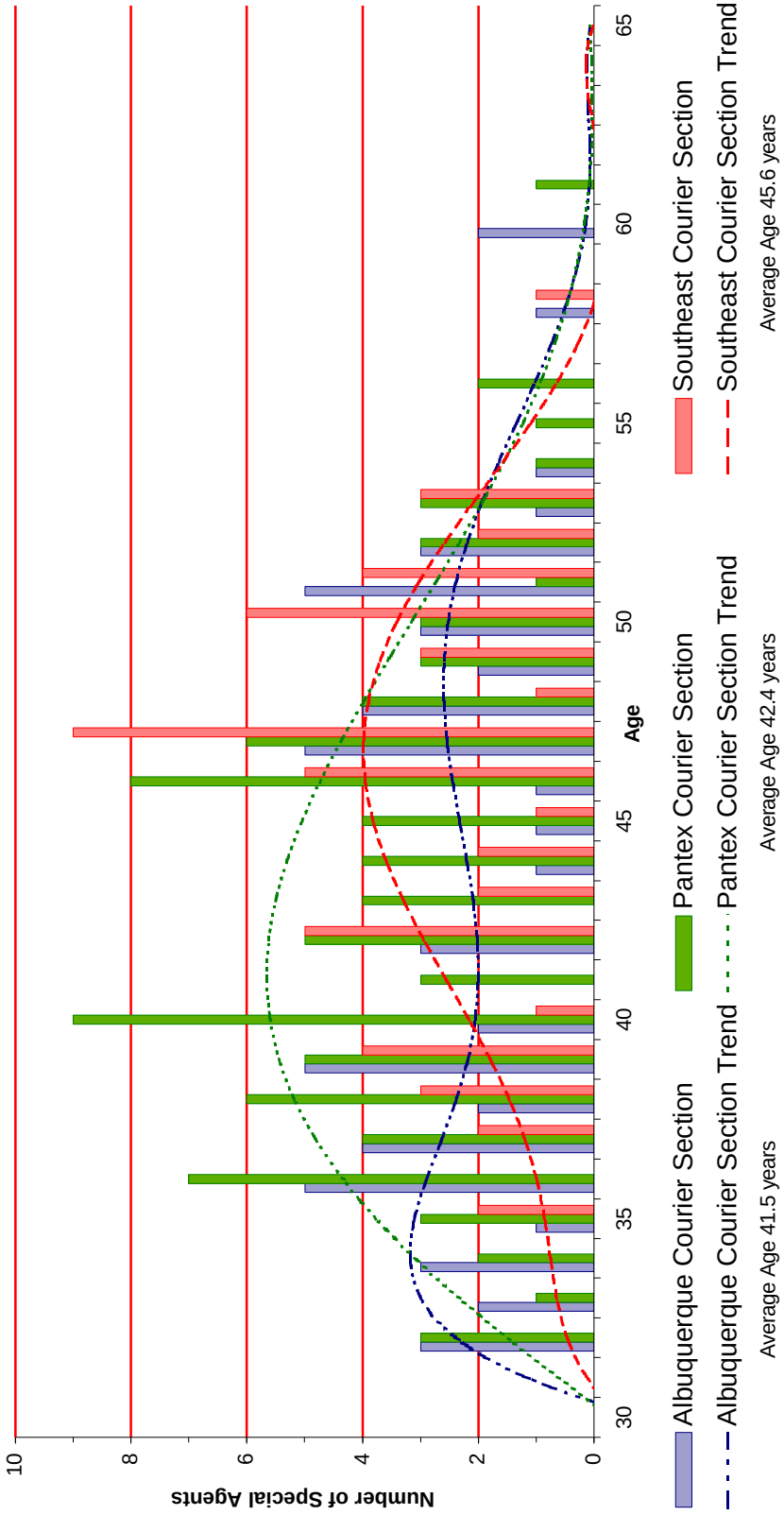


Figure 1-1: Age of Special Agents by Courier Section

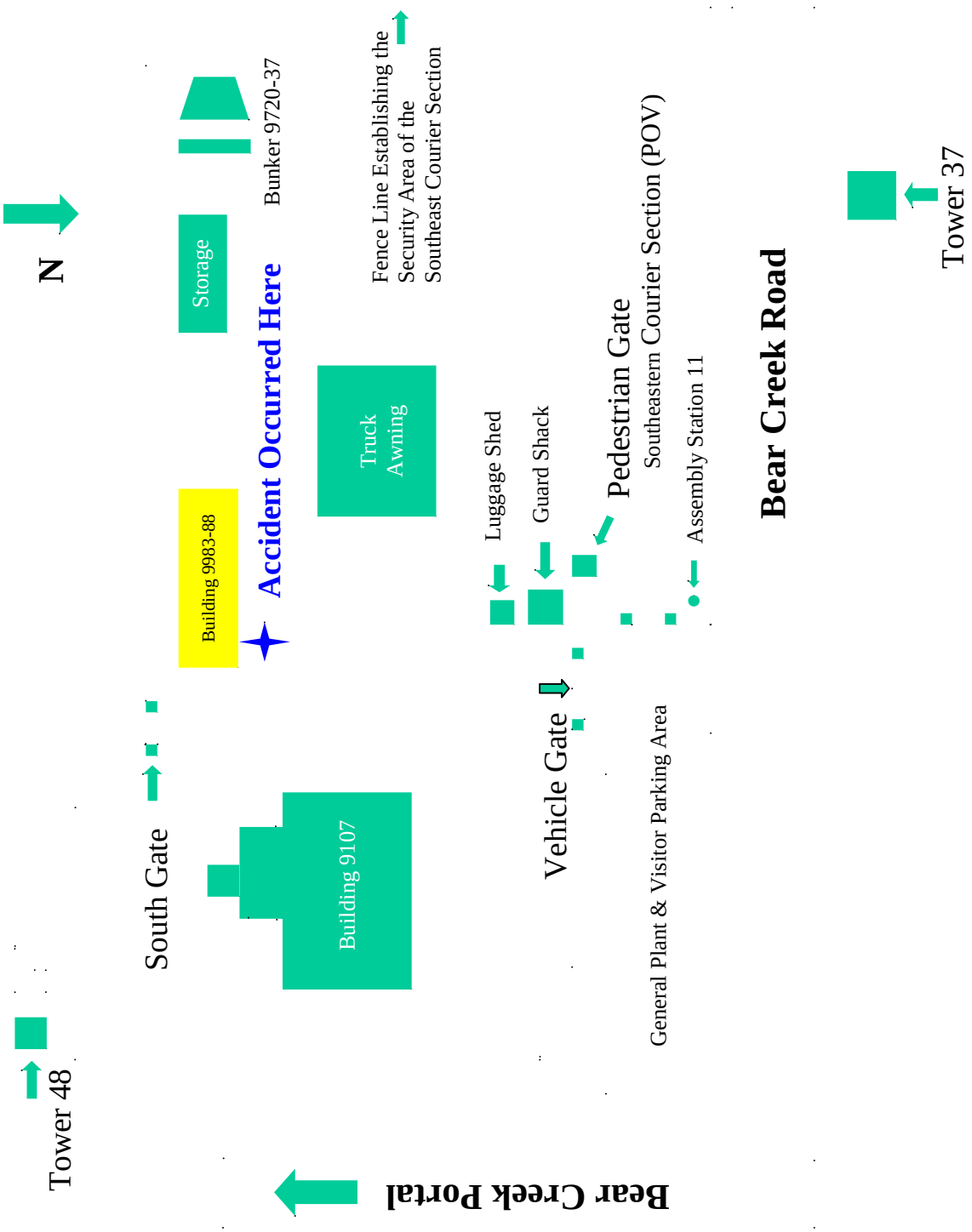


Figure 1-2: Site Map of the Southeast Courier Section

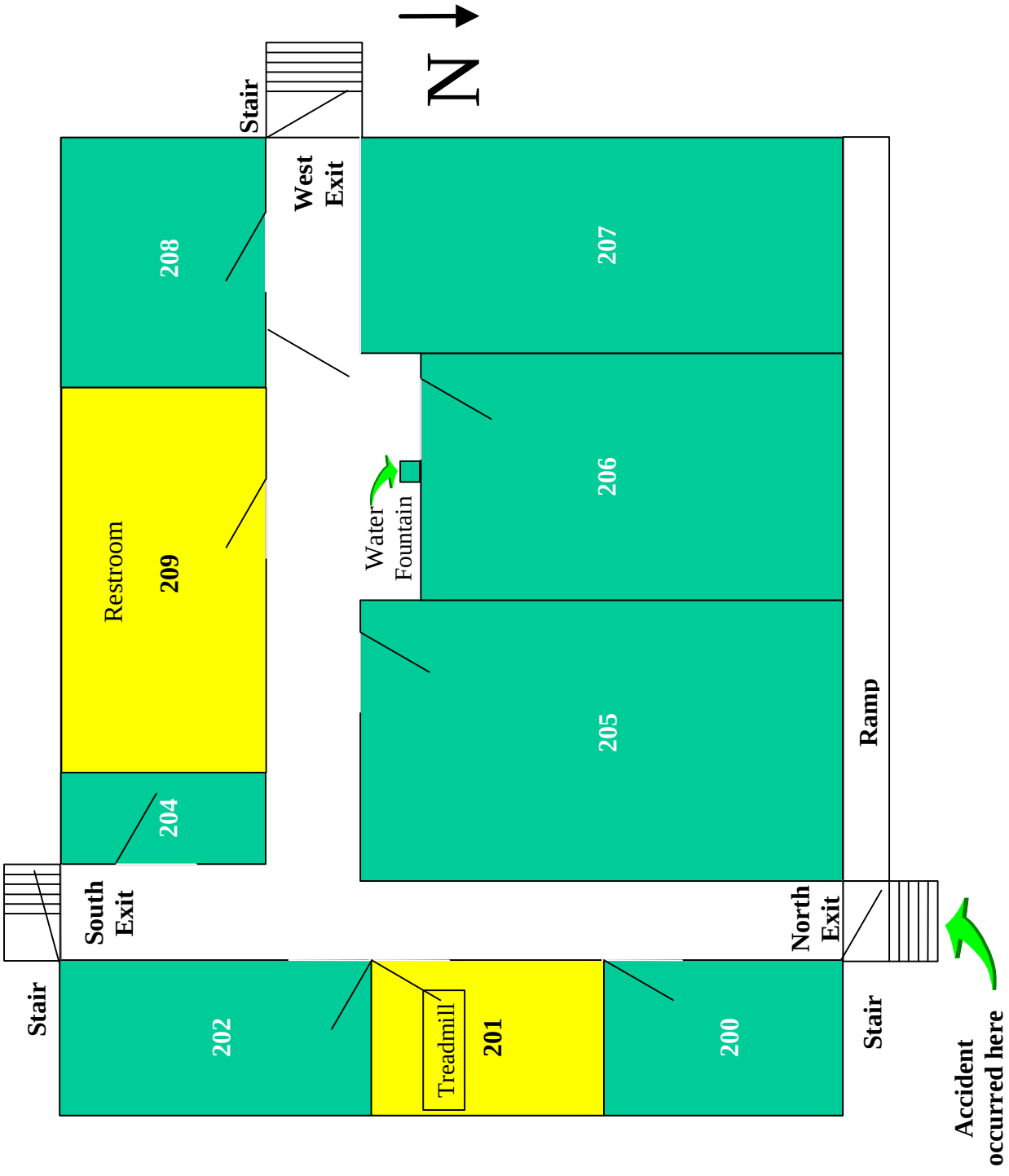


Figure 1-3: Building 9983-88 Layout

The scope of the Board's investigation included all activities required to determine the relevant facts and to review and analyze the facts and circumstances surrounding the accident.

The purpose of the investigation is to identify causal factors of the accident, including deficiencies, if any, in safety management systems. The results of the investigation provide the DOE community with lessons learned to promote program improvement.

The purpose of this investigation is to identify causal factors of the accident and inform the DOE community of lessons learned.

During the investigation, the Board inspected and photographed the accident scene, reviewed documentation from TSD in both Oak Ridge and Albuquerque, reviewed critical events leading to the accident, reviewed safety management systems, and reviewed emergency response activities. The Board conducted forty recorded and transcribed interviews with the Southeast Courier Section management and staff; Albuquerque TSD management and staff; and physicians and medical staff associated with the Medical Program and with Special Agent #1's annual exams. The Board also conducted analyses of evidence and performed causal analysis.

Using identified facts, the Board determined the direct, root and contributing causes; developed Conclusions; and determined the Judgments of Need.

2. FACTS AND ANALYSIS

2.1 ACCIDENT DESCRIPTION

2.1.1 Accident Background

On Monday, April 19, 1999, Special Agent #1 performed his required quarterly physical fitness qualification run. This run was conducted on a Trotter 585 treadmill and included a warm-up period, a run for 8-minutes at 7.5 miles per hour (mph) for the qualification, and a 5 minute cool-down period at 3.0 to 3.5 mph.

Special Agent #1 was performing his quarterly physical fitness qualification.

Special Agent #1 was scheduled to complete his mile qualification run in April. Special Agent #1 selected, the morning of the 19th to complete his qualification. Factors influencing his decision included:

- he had attended an off-site Firearms Instructor Certification training course and a training exercise at Fort Hood, the previous three weeks;
- he was scheduled for a week long trip later that day; and
- he had scheduled family medical leave for the following week.

As required by SCS procedure (Policy 001, dated August 6, 1996) for the *Quarterly Qualification Run Testing*, Special Agent #1 was attended by the SCS's Exercise Physiologist and a second Special Agent serving as a Safety Monitor (Special Agent #2).

2.1.2 Accident Description And Chronology Of Events

Special Agent #1 arrived at the SCS at approximately 8:00 a.m. on Monday, April 19, 1999, and determined that the Exercise Physiologist was on duty. Special Agent #1 talked with the SCS secretary and proceeded to Building 9383-88 (Figure 1-3) to see if he could complete his qualification run that morning.

Special Agent #1 verified that the Exercise Physiologist was available to monitor his qualification run on the treadmill.

After talking with the Exercise Physiologist, Special Agent #1 changed into his exercise clothing. Special Agent #1 was asked a series of questions by the Exercise Physiologist. These questions included whether he has any injuries or conditions that may adversely affect his qualification attempt; whether he did a proper warm-up; and if he is running for official qualification. Special Agent #1 answered "no" to the first question and "yes" to the latter two questions. The Exercise Physiologist marked the answers on the Qualification Slip. In addition, the Exercise Physiologist asked if Special Agent #1 had taken any medication. Special Agent #1 answered that he had not taken any medications. However, Special Agent #1 indicated he was having trouble with his sinuses.

The Exercise Physiologist demonstrated how to get on the treadmill when it was moving and instructed Special Agent #1 to let him know if he was feeling anything unusual during the test. Special Agent #1 got on the treadmill and began walking for a warm-up period of at least 5 minutes. After the warm-up period, Special Agent #1 got off the treadmill and the Exercise Physiologist increased the speed of the treadmill to 7.5 miles per hour. Special Agent #1 stepped back on the treadmill and began the qualification run. At approximately the 7 minute 30 second mark, Special Agent #1 asked how much time he had left. The Exercise Physiologist stated that he had 30 seconds left. Special Agent #1 responded "piece of cake." Neither the Exercise Physiologist nor Special Agent #2 noticed anything unusual during the qualification run. The Exercise Physiologist stopped the test at the 8-minute mark and slowed the treadmill to between 3.0 and 3.5 miles per hour for the cool-down period. The Exercise Physiologist also signed the Qualification Slip indicating that appropriate questions had been asked, that responses were documented and that Special Agent #1 had passed his qualification run.

Special Agent #1 completed his qualification run, walked out of the building with the Exercise Physiologist and Special Agent #2 and collapsed.

After approximately 5 minutes Special Agent #1 got off the treadmill, went to the restroom, and proceeded to drink some water from the fountain.

Special Agent #1, Special Agent #2, and the Exercise Physiologist left the building via the North exit. Special Agent #2 and the Exercise Physiologist were in front, with Special Agent #1 behind. As Special Agent #1 reached the bottom of the stairs (See Figures 2-1, and 2-2) he said "Whoa, Whoa, Whoa, John," and started to collapse. Both the Exercise Physiologist and Special Agent #2 assisted Special Agent #1 to the ground at the base of the stairs at approximately 8:50 a.m. The Exercise Physiologist realized that this event was more than a person passing out and immediately directed Special Agent #2 to call 911.

Special Agent #1 collapsed and is assisted to the ground by the Exercise Physiologist and Special Agent #2.

2.1.3 Emergency Response

Special Agent #2 returned to Building 9383-88 and dialed 911. This connected him with the Y-12 site emergency response group. The call was received and the Y-12 site ambulance was dispatched at 8:51 a.m.

The 911 call was received at 8:51 a.m.

The ambulance departed for the SCS at 8:52 a.m., with Emergency Medical Technicians (EMTs) #1 and #2 onboard. The ambulance arrived at the scene at 8:55 a.m.

Figure 2-1: Building 9983-88, Looking Southwest

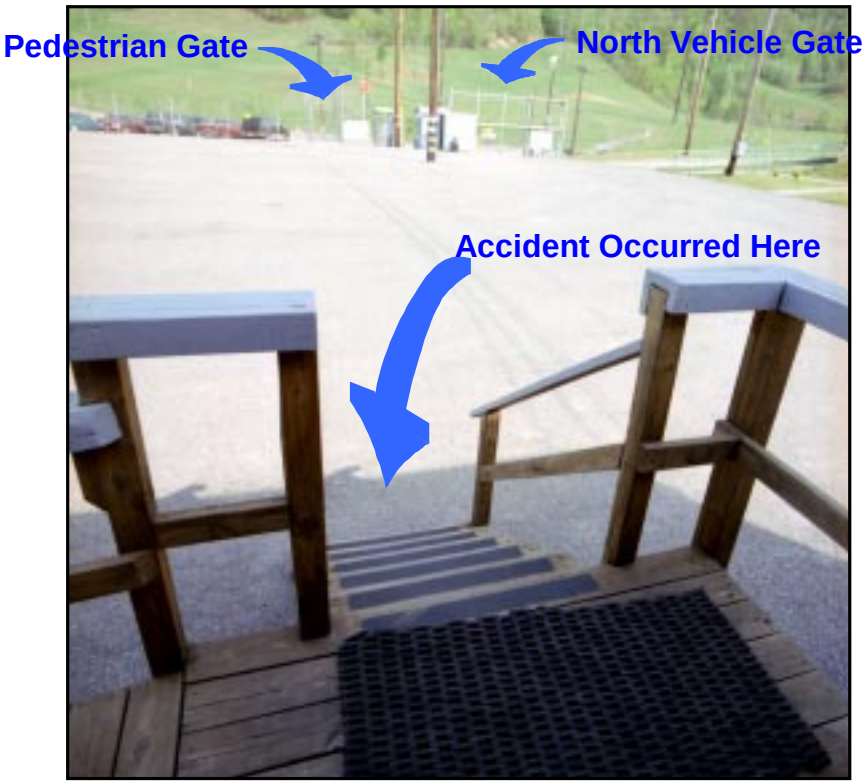


Figure 2-2: Building 9983-88, Looking North

Exercise Physiologist provided emergency care to Special Agent #1.

While Special Agent #2 went to call 911, the Exercise Physiologist kept telling Special Agent #1 to keep breathing and to hold on. Special Agent #1's breaths were sporadic and labored. Another colleague (Special Agent #3) exited Building 9107, noticed the activity at Building 9983-88, realized that Special Agent #1 had collapsed and ran to assist. The Exercise Physiologist asked Special Agent #3 to get something to place under Special Agent #1's head. Special Agent #3 went inside Building 9383-88 and returned with a trauma kit to be used as a cushion. At about the same time Special Agent #2 arrived with a comforter. Special Agent #1's breathing had stopped and the Exercise Physiologist was about to use a Cardiopulmonary Resuscitation (CPR) pocket mask to perform pulmonary resuscitation on Special Agent #1 when Special Agent #1 took another agonal breath. The Exercise Physiologist checked to see if Special Agent #1 had resumed breathing. He did not see any indication that Special Agent #1 had resumed breathing and was again ready to use the CPR pocket mask when the ambulance arrived.

Emergency Medical Technicians arrived and provided emergency care.

The EMTs in the ambulance and the Training Relief (TR) Shift Fire Commander in a pickup truck were ushered through the North Vehicle Gate (See Figure 2-2) and directed to the scene. The EMTs were informed by the Exercise Physiologist that Special Agent #1 had just stopped breathing. EMT #1 started artificial ventilation with a Bag Valve Mask (BVM) and requested that the TR Shift Fire Commander call for more assistance. EMT #3 and #4 arrived onsite shortly thereafter. EMT #2 provided support to EMT #1 and the TR Shift Fire Commander, as needed. The Exercise Physiologist asked the EMTs if they had any oxygen with them. The Exercise Physiologist connected the tubing to the oxygen supply and the BVM and EMT#1 continued the BVM ventilation of Special Agent #1.

Special Agent #1 had no palpable pulse. The TR Shift Fire Commander connected Special Agent #1 to an Automatic Electronic Defibrillator (AED)[1]. The AED automatically analyzed Special Agent #1's cardiac condition and advised, "to shock." EMT #1 and the TR Shift Fire Commander shocked Special Agent #1 at 200 Joules (J). BVM ventilation was continued and reanalysis by the AED recommended to shock again. Special Agent #1 was shocked a second time at 300 J.

EMT #1 presumed that the initial cardiac rhythm was asystole from the initial exam, although the age of the Y-12 AED in use precluded computer storage of the initial tracings. The strip printout capability of the AED had been previously disabled because of security regulations of the Y-12 operating contractor. No one at either SCS or Y-12 who

[1] The AED automatically resets from 200 J to 300 J to 360 J. with each shock delivered. After attaining 360 J all subsequent shocks are delivered at this maximum power.

responded to the scene are authorized to dispense medications except for the starting of an intravenous drip (IV). No IV was started on Special Agent #1 on-site or enroute to the hospital. The Board determined that not having an AED record and not starting an IV had no effect on the outcome of this event

BVM ventilation continued and a third analysis after the second shock again recommended to shock. Special Agent #1 was shocked at 360 J. Following this shock, CPR compressions were started along with the BVM ventilation. Another AED analysis was made and the AED advised not to shock. A COMBI Tube (airway) was inserted; however fluid was found in both tubes. The fluid was suctioned and an oral airway was inserted and BVM ventilation of Special Agent #1 resumed.

Special Agent #1 was strapped to a backboard and placed on a gurney. Prior to being placed in the ambulance, a fifth AED analysis was made. The AED advised to shock a fourth time. Special Agent #1 was shocked at 360 J and placed in the ambulance. The ambulance departed for the hospital at 9:11 a.m., with Special Agent #1, EMT #1, and EMT #3 in the back, and EMT #2 driving. The TR Shift Fire Commander requested from the Y-12 Control Center that the ambulance be allowed to proceed straight to the hospital rather than the Y-12 medical facilities. The physician at Y-12 granted permission, and the ambulance proceeded to Methodist Medical Center of Oak Ridge.

Special Agent #1 was transported to the hospital after four unsuccessful AED shocks were administered.

The ambulance arrived at the hospital at 9:17 a.m. and an Emergency Room code attempt was performed. This was unsuccessful and the attending physician pronounced Special Agent #1 dead.

Special Agent #1 arrived at Methodist Medical Center where he was pronounced dead.

2.1.4 Investigative Readiness

After the ambulance left for the hospital, the trauma kit and Special Agent #1's tee shirt were returned to Room 200 in Building 9983-88. The tee shirt had been cut and removed during the treatment of Special Agent #1. The TR Shift Fire Commander and EMT #4 cleaned up the scene and removed biohazards resulting from the treatment of Special Agent #1. The TR Shift Fire Commander then talked with the Exercise Physiologist to determine what happened prior to the EMTs' arrival.

To secure the scene, the SCS Section Chief locked Building 9983-88 a few minutes following the departure of the ambulance for the hospital. Later in the afternoon, the Section Chief requested that the Assistant Section Chief go with the Exercise Physiologist to remove the Exercise Physiologist's personal bag and to seal the building. The Assistant Section Chief and the Exercise Physiologist proceeded to Building 9983-88, the Exercise Physiologist removed his personal bag, the Assistant Section Chief locked and sealed each of the three doors into the

Biohazards were cleaned up and Building 9983-88 was secured.

building with computer security labels and placed a posting of "Do not enter" on the building doors. The Assistant Section Chief signed this posting. The building remained sealed until the Board inspected the inside of the building on April 21, 1999.

Personal and DOE effects were removed from Special Agent #1's lockers.

Special Agent #1 had two lockers in Building 9107 that contained personal effects and DOE issued equipment. These lockers were secured. Special Agent #1's Deputy Unit Commander and the SCS Training Specialist opened one locker by cutting the lock on April 20, 1999. They inspected Special Agent #1's locker to separate personal from DOE issued items. The travel bag Special Agent #1 was going to use on his scheduled trip was opened to place Special Agent #1's personnel effects into the bag, but the general contents were not examined. They then returned the travel bag to Special Agent #1's family. The SCS Training Specialist drove Special Agent #1's private vehicle to the family residence.

The same individuals opened the second locker by cutting the lock on April 26, 1999, and the personal and DOE issued items were separated. Personal items were returned to Special Agent #1's spouse. Neither the Deputy Unit Commander nor the SCS Training Specialist, identified any medications (prescription or over the counter), or anything that they felt was unusual or out of the ordinary.

Although the Board did not observe the opening of the lockers and distribution of the personnel effects, it did not impact the accident investigation process or the Conclusions and Judgments of Need identified by the Board.

2.1.5 Medical Evaluation

Special Agent #1 had long-standing hyperlipidemia (elevated cholesterol and tryglycerides), and on one occasion had transient mild diastolic hypertension.

The Medical Advisor to the Board reviewed Special Agent #1's medical records. Review of his medical history indicates a persistent hyperlipidemia since 1988 (See Appendix C), and one occasion of a transient mild diastolic hypertension. On July 7, 1997, Special Agent #1 had an exam that identified a blood pressure of 126/92. This disqualifying PAP requirement was initially missed by the Designated Physician and the Site Occupational Medical Director (SOMD) and was not discovered until September 10, 1997, by the AL Health Unit nurse. Three additional blood pressure readings were within normal values one week later and his PAP Certification was reinstated.

On Special Agent #1's latest physical exam performed on August 7, 1998, by the Designated Physician at the Park Med Ambulatory Clinic, Oak Ridge, TN, his medical evaluation was essentially normal. A biochemical profile done at that time indicated an elevated cholesterol of 281 (125-200) and triglycerides of 353 (10-150), along with low-density

lipids of 171 (70-130). High-density lipids (HDL) were marginally within normal range at 39 (>35). The standard coronary risk assessment ratio of cholesterol/HDL is 7.2, putting Special Agent #1 in a high-risk group. The remainder of the biochemical profile was within normal limits.

At the last physical examination in August 1998, Special Agent #1's blood pressure was measured at 136/86 with a resting pulse of 72. Urinalysis and Bound Urinary Nitrogen/Creatinine were within normal limits. In addition, pulmonary spirometry was found to be normal. At this exam, Special Agent #1's weight was 201 pounds with a height of 70 inches. This correlates to a body mass index (BMI; mass/height^2 (kg/m^2)) of 28.9, which is elevated compared to the upper limit of normal of 25.

A graded Bruce Protocol Treadmill exam was performed on August 5, 1998 at Cardiology Associates of East Tennessee as part of the annual medical evaluation. Baseline blood pressure there was 140/90, rising to 164/80 during stage IV of the exam. A maximal heart rate of 158, which is 91% of the maximal predicted heart rate, was recorded for the exam. The electrocardiogram (EKG) taken during the treadmill showed up-sloping ST segment changes, which can be non-specific. The test was read as negative by the cardiologist.

CVD, including heart disease and stroke, affect approximately 57 million and is the direct cause of 42% of all U.S. deaths.

Cardiovascular disease (CVD), including heart disease and stroke, affects approximately 57 million Americans, and is the direct cause of 42% of all deaths in the United States (Centers for Disease Control, 1999). In addition, heart disease is the leading cause of death for all males age 35 and older. From epidemiological studies, one in four Americans are found to have CVD. Various coronary heart disease risk factors (overweight, elevated lipids, hypertension, cigarette smoking, diabetes, etc.) have been identified. A review of 43 epidemiological studies in 1987 indicated that elevated serum lipids were associated with a relative risk of 2.4 for development of coronary disease. However, cigarette smoking was the single most important modifiable life-style factor linked to the development of heart disease. Many risk factors also interact synergistically in the etiology of cardiovascular disease and persons with risk factor combinations (for example, cigarette smoking, hyperlipidemia, obesity, and hypertension) are at an increased risk for a myocardial infarction. For example, moderate obesity (BMI, greater than or equal to 27.8 for men and 27.3 for women; 85th percentile for the general population) is an example of a risk factor for heart disease that can influence other risk factors, including hyperlipidemia, hypertension, and diabetes mellitus.

2.2 ACCIDENT ANALYSIS

Special Agent #1 collapsed at the Y-12 TSD facility on Monday, April 19, 1999. He had completed running a required qualification 8-minute mile on the treadmill when he collapsed. The collapse was witnessed by the Exercise Physiologist, who began appropriate airway management and emergency response, and by Special Agent #2 (Safety Monitor).

Special Agent #1 suffered an acute myocardial infarction.

From the official C*ertificate of Death*, the cause of death is an acute myocardial infarction (MI) with occlusion of the left anterior descending coronary artery (LAD) due to coronary artery disease. In addition, a posterior septal infarct scar was noted, consistent with an old, healed MI of the posterior septal region of the heart. According to the Medical Advisor to the Board and to the cardiologist who last examined Special Agent #1, a posterior septal infarction would be the most difficult to detect by an electrocardiogram. Complete details of the autopsy report are not available to the Board at this time. The certificate of death was, however, signed by a local forensic pathologist, who performed the autopsy.

Special Agent #1 stated he was currently on no medication prior to his qualification. He reported no presumptive symptoms of cardiac disease or pulmonary disease (chest pain, shortness of breath, dyspnea at rest) immediately prior the qualification run. In addition, Special Agent #1 was a non-smoker (smoking is the most common modifiable risk factor for sudden coronary disease). In the case of Special Agent #1, the long-standing type II hyperlipidemia was the major risk factor for cardiac disease.

2.3 SAFETY MANAGEMENT

The Transportation Safeguards Division is a group of Federal employees, who report to the AL Manager. DOE Order 5632.7A, Change 1, *Protective Force Program*, Section 7.f, states that the AL Manager, "…shall ensure the development of medical, physical fitness, and training program requirements, and operating procedures for Transportation Safeguards Division protective force personnel." In addition, Section 2.b.(3), Chapter I of the Order states that, "Federal Officers shall complete a formal training program prior to assignment to duties. The training program shall be based on assigned functions. Physical and medical qualification shall meet Departmental and/or Office of Personnel Management requirements for the position assignment." Based on these requirements, TSD developed the *Employment Requirements for Nuclear Material Couriers*, PER-0100-95-007, Revision 1, issued June 2, 1995, with a page change on January 10, 1997.

The medical and physical fitness requirements are closely related topics to this investigation and are discussed in Section 2.3.1 and 2.3.2, respectively.

Proper, timely emergency response to an accident/incident is an important factor mitigating the consequences. Section 2.3.3 discusses the current status of formal agreements with the local emergency medical service providers for the three courier sections.

TSD has been the subject of some twenty-seven (27) external assessments from January 1996 to present. In addition, TSD performed self-assessments in 1996, 1997, and 1998 and is currently completing their assessment for 1999. Section 2.3.4 discusses the external and internal TSD assessments.

The Integrated Safety Management System is an initiative of the Secretary of Energy. This program focuses on the incorporation and full involvement of all disciplines in assessing hazards, implementing controls and soliciting feedback and improvement. Section 2.3.5 provides a discussion of this topic.

2.3.1 Medical Program

Medical Fitness Standards

TSD Special Agents are required to meet the PAP requirements currently defined in 10 Code of Federal Regulations (CFR) Part 711 issued September 8, 1998. Special agents are also required to meet the *Employment Requirements for Nuclear Material Couriers* defined in TSD Policy Number PER-0100-95-001. This policy replaced AL Supplemental Directive 56XA Chapter VIII dated May 12, 1992.

Special Agents are required to meet the medical requirements in 10 CFR 711.

Annex A of PER-0100-95-001 entitled, Standard on Medical Fitness for Courier Applicants and Courier-Qualified Personnel provides the basis for determining "fitness for duty." These are the same medical requirements defined and approved for the Special Agents by the Office of Personnel Management on May 14, 1984, which expired April 30, 1985.

PER-0100-95-001 provides the Special Agent fitness for duty requirements and fulfills the requirements of 10 CFR 711.

The medical requirements in the PAP Rule 10 CFR Part 711 and TSD *Personnel Assurance Program (PAP) Policy*, OPS-0201-97-001 dated June 6, 1997, are general and do not contain the specificity defined in Annex A of PER-0100-95-001. However, the requirements of Annex A do fulfill the general requirements of PAP.

The "Physical Performance Requirements" are defined in Section 11 of TSD *Personnel Assurance Program (PAP) Policy* OPS-0201-97-001.

All Special Agents are required to run one-mile in eight minutes and one-quarter mile in 85-seconds, qualifying quarterly and alternating the runs. Section 2.3.2 of this report provides a historical perspective on the physical fitness qualification requirements.

The Board interviews indicate that medical requirements are disassociated with the quarterly qualification runs and are exclusively associated with the PAP Certification process. The medical requirements have been in place for some seventeen years without update or a comprehensive integrated review.

Medical stress tests are conducted at 85% of predicted maximum heart rate.

Current medical stress tests are measuring stress at 85% of the predicted maximum heart rate capacity during the annual medical examination. However, the Special Agents reach nearly 100% during their qualification runs. This added stress/risk is not assessed during the cardiology evaluation according to the Exercise Physiologists. The SCS Exercise Physiologist documented three concerns to the TSD Director on December 9, 1997. On May 22, 1998, the Director, TSD responded to these employee concerns. The first two concerns related to open communication between the SOMD and the Exercise Physiologist and the need for mandatory physical fitness evaluation. The response contained appropriate corrective actions for the first two concerns. However, the response to the third concern, "Special Agents are running at higher levels of exertion during qualification runs than during annual treadmill tests" does not address the Exercise Physiologist's issue. This issue still exists among the Exercise Physiologists. The current SOMD indicated it may require more extensive evaluation by leading cardiologists in order to resolve this technical concern.

PAP Certification

The requirements for a SOMD and Designated Physicians defined in 10 CFR Part 711 for PAP has been implemented since the 1980's by TSD. Each of the courier sections has a Designated Physician to perform the annual physical exams and ensure those additional medical evaluations, such as the annual cardiac stress tests for anyone over forty years of age are completed. The 11A medical evaluation form (AL F 3970.11A) with the personal history sheet, laboratory results and cardiac stress test results, if performed, are forwarded to the AL Health Unit and then to the SOMD for review and Certification. The results are certified to ensure a PAP individual is medically acceptable to participate in the PAP and does not have a condition that may prevent performance of nuclear explosive duties in a safe and reliable manner. Results from previous years of examinations are not provided to the SOMD unless requested.

If a Special Agent does not meet a specific requirement, he is required to have additional monitoring and his PAP Certification is withdrawn until

the SOMD is satisfied that he meets the PAP requirements. During this time, when his PAP Certification is withdrawn, the Special Agent is not allowed to participate in any TSD nuclear explosive duties.

In addition to the results required by PAP, the 11A medical form also has an entry:

The 11A medical form has a referral section to the Special Agent's private physician for non-PAP issues.

> ( ) The employee should follow-up with private physician for own well-being for the following: _____.

The physician can enter any additional information such as elevated cholesterol, hyperlipidemia, etc. The intent of this referral is for the Special Agent to share it with his private physician and have appropriate follow-up. However, it is not mandatory that the Special Agent do so. The completed 11A form is forwarded by the TSD PAP Administrator to the appropriate courier section secretary for retention and distribution to each Special Agent. It is the responsibility of the Special Agent to follow-up with his private physician.

The PAP administrator, in the TSD Support Branch, annually reviews the signatures on the Personnel Assurance Program Certification/Recertification to ensure that all of the medical, training, and qualification requirements are completed and has the Director of TSD certify the applicant's acceptability.

Historical Case

Historically, the PAP Administrator has been involved in the decision to require an SCS Special Agent to perform a qualification run immediately upon receiving the approval from the SOMD that "the employee meets the Special Agent medical standards."

In February 1995, a SCS Special Agent received a medical release from the SOMD and reported to the Exercise Physiologist for an evaluation. The Exercise Physiologist and the Special Agent himself expressed concern that he was not ready to make the one-mile qualification run and needed approximately two weeks to condition. The 1995 version of PER-0100-95-001, *Employment Requirements for Nuclear Material Couriers*, Section 8(b) states, "… upon documented medical release by a PAP physician, reasonable time to regain the required level of proficiency shall be allotted."

The SCS Section Chief discussed the need for this Special Agent to perform his run with the PAP Administrator and both agreed the Special Agent needed to qualify immediately. The Exercise Physiologist participated in a conference call with the Section Chief and the PAP Administrator and requested that the PAP Administrator talk with the

SOMD. In the Board interview, this PAP Administrator indicated there was no need to go back to the SOMD since they already had a written release.

The Exercise Physiologist felt uncomfortable with this decision and refused to time the qualification run. The Training Specialist timed the Special Agent's qualification run. The Special Agent failed his qualification requirement and was placed in a running rehabilitation program.

While working with the Special Agent in the rehabilitation program, the Exercise Physiologist detected an irregular heartbeat and referred the Special Agent to his Private Physician. Less than a month later, the Special Agent had multiple bypass surgery.

This previous PAP Administrator and the incumbent in this position, have an administrative background. The Board interviews with the current TSD Management responsible for the PAP program and for operations indicate that the PAP Administrator no longer participates in the decision making for qualification runs.

The investigation and follow-up to this 1995 employee concern was informal. However, TSD has implemented several changes that are intended to correct the issues.

Exercise Physiologist

Exercise Physiologists were introduced in 1991.

Exercise Physiologists were introduced into the TSD Program in 1991 and currently each Section has a trained and experienced Exercise Physiologist. The SCS has had the same Exercise Physiologist since December 1993. He has been actively involved with the rehabilitation programs of Special Agents who have not successfully completed their qualification runs. These programs require a minimum of six to nine weeks, with weekly evaluations by the Exercise Physiologist and usually daily data gathering by the Special Agent. The *Physical Fitness Rehabilitation Program Policy*, PER-0202-95-011 dated October 25, 1995, describes the program requirements. Of note, Special Agent #1 has never been required to participate in the rehabilitation program.

In addition, the SCS Exercise Physiologist indicated that, if requested by a Special Agent, he will perform diet counseling; fitness assessments; review of medical issues, such as blood pressure, high cholesterol; and routine monitoring of weight, blood pressure and heart rate. The Board interviews indicated that the SCS Exercise Physiologist is well known and respected by the Special Agents.

One issue that has been evident at SCS and with the other Exercise Physiologists is the need to have access to medical data, the Designated Physician and the SOMD. Because of contractual arrangements, the physicians and Exercise Physiologist have had limited communication and the physicians were not able to request actions of the Exercise Physiologist for a specific Special Agent. This issue was corrected in October 1998, with a modification to the contract to have the Exercise Physiologist report to the SOMD. The implementation in October 1998 was hampered due to the contractor/subcontractor arrangements that existed and the fact that the SOMD left the primary contractor on March 31, 1998.

Exercise Physiologists need to have medical information.

In April 1999, an Interagency Agreement between DOE and Federal Occupational Heath replaced the previous contract. This Interagency Agreement contained the same reporting requirements for the Exercise Physiologist and SOMD that were implemented in October 1998. The arrangements with the new contractor have been in effect approximately one month and to date not enough experience has been gained to verify that the current organization interfaces will result in improved communication between the Exercise Physiologist and SOMD. However, the appropriate contractual requirements are in place and provide the necessary framework to assure communication between the SOMD and the Exercise Physiologist.

Medical Services

Lovelace Scientific Resources, Inc., has provided the TSD medical services since the early 1990's. The same SOMD served from 1994 – 1998. Since March 31, 1998, there have been three SOMDs associated with the program, one for eight months, one for seven months and the most recent for one month. The performance period for the TSD medical services contract with Lovelace Scientific Resources, Inc., ended April 1999.

There have been three SOMDs since March 1998.

As noted above, an Interagency Agreement with Federal Occupational Health was established in April 1999. Federal Occupational Health is a provider of health and safety services for federal employees and affiliated with the U.S. Public Health Service, and agency of the US Department of Health and Human Services.

Federal Occupational Health contracts to physicians and physician groups to provide required medical support. In this new arrangement, a certified occupational medicine physician with a specialty in musculo-skeletal physiology and rehabilitation has become the SOMD.

Likewise there have been changes within the Oak Ridge Designated Physicians. For several years, Emergency Room Physicians from the

Methodist Medical Center of Oak Ridge provided the medical exams. In 1998 Park Med Ambulatory Care provided the exams. In April 1999 Concentra began providing the physicians as a result of implementing the interagency agreement.

The Cardiac Associates of East Tennessee in Knoxville and Parkway Cardiology Associates in Oak Ridge have provided the cardiac stress tests for the SCS Special Agents from 1994 until April 1999. Parkway Cardiology Associates is currently providing the cardiac evaluations under the new contract.

The Board's interview with the current SOMD focused on his plans for the future TSD Medical Program. He displayed a positive and proactive outlook. Since his tenure is approximately two months, he is still learning the TSD system. He has already met with the Exercise Physiologist from the Albuquerque Courier Section and plans to meet with the other Exercise Physiologists when he visits the other sections. The SOMD has a strong background in correcting musculo-skeletal problems and Board Certified in Occupational Medicine. As the Board toured his clinic, his patient skills were evidenced by an approachable, friendly style with patients in rehabilitation.

Medical Records

Complete medical records are a key component of the medical profile. With the changes in medical providers, special attention must be given to maintaining continuity and complete medical records. The primary medical record is maintained at the office of the Designated Physician. With each change in the Designated Physicians, the records have been transferred to the successor Designated Physician.

The record does not include a "problem list" summarizing the medical issues previously identified. The focus of the annual exam is to fulfill the current medical requirements of the PAP.

Medical records do not include a "problem list" and have been reviewed for consistency.

As shown in Appendix C, Special Agent #1 had elevated lipids back to 1988. The 11A form that summarizes his PAP results consistently noted his problem and referred him to his private physician for follow-up. The medical records has three notes (1993, 1995 and 1995) on this topic. The cardiology reports in the primary file varied from a one-page summary from Parkway Cardiology Associates to a summary and full electrocardiogram tracing from the cardiac stress test performed by Cardiac Associates of Tennessee.

A summary of the annual exam, laboratory results and cardiac evaluation, if performed, is forwarded from the Designated Physician to

the AL Health Unit. This record is forwarded to the SOMD for Certification and records for the last two years are maintained in the Health Unit file. The 11A PAP Certification form that is signed by the SOMD is forwarded to the PAP administrator and retained in the Special Agent's PAP file. A copy is also provided to the Special Agent.

The Board did not find that a review and verification of the medical records system has been performed to ensure that the records meet the customary medical standards for maintenance of medical records.

2.3.2 Physical Fitness Program

Three specific physical fitness studies have been completed since 1981.

Three specific studies have been conducted to define appropriate physical fitness performance standards for Special Agents and Security Police Officers. The early studies, conducted by Dr. Hemming Atterbom (Atterbom Study) and William Telfair (Telfair Study), were conducted in 1981 and 1982, respectively. These studies did not address aging in relation to physical fitness. In 1993, Dr. Thomas Collingwood conducted a study for the Cooper Institute for Aerobic Research (Cooper Study). This study again defined physical fitness performance tests, but considered the aging of the workforce. In 1998, an additional study of TSD management concerns by Gordon Moe (Moe Report) was conducted. In this last study, the physical fitness performance tests were addressed.

Atterbom Study

Atterbom Study is the basis for the current Special Agent fitness standard.

The Atterbom Study has been identified by TSD as the basis for the current quarterly physical fitness standard:

- a one-mile run in 8-minutes and
- a 440-yard dash in 85-seconds.

However, the standard recommended by the Atterbom Study is based on performing each of the following quarterly:

- 220-yard dash,
- 440-yard sprint,
- 880-yard run, and
- 1-mile run

The times for these runs are to be recorded and scored via formulas identified in the study. Atterbom recommends an employment standard of 160 points (average of 40 points per running test) to start and increasing to 200 points over 3 years. This equates to the following times to accumulate the recommended number of points:

	40 Points	50 Points
220-yard dash	32.7 sec	30.5 sec
440-yard sprint	1:13.2 min	1:07.7 min
880 yard run	2:59 min	2.24 min
1-mile run	6:52 min	6:22 min

The 85-second quarter mile and 8-minute mile qualification requirements currently used by TSD equates to 18.5 and 17 points, respectively. This is below the recommended average of 40 and 50 points identified in the Atterbom Study

Atterbom also recommends that:

- "A courier who fails the Combat Effectiveness Score standard should be provided ample time and assistance to remedy specific weaknesses and qualify during the subsequent testing session."

- "The possibility of scheduling the couriers alternately one week on base and one week on the road should be explored."

- "A physical fitness program suitable for the courier working conditions should be developed." Currently, the physical fitness program is voluntary if the Special Agent meets his mile and quarter mile run times.

Based on a Board discussion with DOE employees who were part of TSD Management at the time of the Study (1981), the Special Agents who participated in the Study were physically fit, maintained the fitness by running five miles several times a week, exercised five days a week, and had an average age of 34 years. Also, medical evaluations prior to quarterly physical fitness qualifications were not conducted, since the Special Agents were considered to be physically fit, and a young cohort.

10 CFR 1046

For DOE contractor employees at Government-owned / Contractor-operated facilities, the physical fitness and medical qualifications standards are set forth in 10 CFR 1046, *Physical Protection of Security Interests*. The basis for the physical fitness standard was a study conducted by William Telfair, entitled *DOE Physical Standards Validation Study* and dated October 30, 1982. For the "Offensive

10 CFR 1046 defines the physical fitness and medical qualification standards for DOE contractor security forces.

Combative Standard," the Security Police Officers must meet the standards of:

- An annual one-mile run with a qualifying time of 8:30 minutes and
- An annual 40-yard prone-to-running dash with a maximum qualifying time of 8.0 seconds.

10 CFR 1046 requires a physical exam not more than 30 days prior to a physical fitness qualification standard test or before entering a physical fitness training program. These standards apply only to contractor personnel and have not been adopted by TSD.

AL 56XA

Supplemental Directive, AL56XA, *DOE Transportation Safeguards System*, was reissued on May 12, 1992, and canceled the October 17, 1988, version. This directive set forth policy and objectives, and delineated responsibilities and authorities of management. In this directive, the TSD selected Atterbom fitness standards were incorporated. AL Supplemental Directive, 5610.14, *Transportation Safeguards System Program Operations*, Change 1, dated December 15, 1994, superseded this directive and does not include the medical and physical fitness requirements. On August 16, 1995, TSD policy, E*mployee Requirements for Nuclear Material Couriers*, PER-0100-007 Revision 1, Page Change 1, was issued to formally document the requirements, including the Atterbom standards.

Cooper Study

Cooper Study recommends a program of all around physical fitness. Basis for proposed 20-year retirement.

The Cooper Study was conducted in 1993, to develop and validate physical fitness standards for the Nuclear Materials Courier position, which is now the Special Agent position. The purpose of this study was to define standards pertinent to justifying a 20-year retirement plan for the Special Agents. The rationale for the retirement was that the current physical and stressful demands of the tasks of the job are such that the agents cannot maintain the required level of fitness beyond the 20-year time period. The Study supported the use of a quarterly physical fitness test battery measuring five areas:

- Aerobic power – 1.5 mile run in 13:05 minutes,
- Anaerobic power – 300-meter run in 64.3 seconds,
- Lower body strength – leg press ratio of 2 to 1 (leg press to body weight)
- Upper body muscular endurance – 20 push-ups in a minute, and
- Abdominal strength endurance – 22 sit-ups in a minute.

The relationship of age to physical fitness was also addressed. The study group stated that there is a performance decline with age, since there is a decline in aerobic power. However, the study group stated that the older agents can meet the Cooper physical fitness standards, if the agents maintain a training regiment. The study group concluded that performance declines are due more to a lack of activity rather than age and that the extent of the agents' traveling facilitated the sedentary effect that is attributed to aging. Therefore, the study group recommended that a total fitness program be established to address this issue. As stated in TSD Management interviews with the Board, the recommendations developed by this study were not implemented because of mission impact and cost.

Moe Report

Moe report addresses implementation of physical fitness study recommendations by TSD.

On July 13, 1998, a team lead by Gordon Moe submitted the results of their study in a report titled *TSD Safeguards Division Review Group* (Moe Report). This review addressed the physical fitness standards in addition to other topics. The review was chartered by the Assistant Secretary of Energy for Defense Programs and the AL Manager to address DOE management concerns over public claims being made against TSD regarding personnel radiation safety and other related issues.

The Moe Report recommended that the AL Manager require TSD to adopt a physical fitness and maintenance standard consistent with the recommendations of the Cooper Study. The Moe Report also indicated that the response from TSD Management concerning the Cooper Study recommendations was somewhat arbitrary and lacked justification for their rejections.

TSD Physical Fitness Improvement Team

On October 1, 1998, TSD formed a Physical Fitness Improvement Team to reevaluate the Cooper Study and "to redefine the job performance standards and physical fitness requirements which do not unfavorably impact the TSD mission." The Team is composed of AL staff and there is no medical participation on the Team. This Team is in the process of formalizing their report to TSD Management. However, no report or technical basis is available at this time.

However, viewgraphs used to brief TSD Management were provided to the Board. Based on these viewgraphs, the Team is considering adopting the 10 CFR 1046 requirements for the mile run and the 40-yard dash. However, they would be performed on the same day every six months rather than annually. The medical requirements established in 10 CFR 1046 were not considered because they were "outside of the charter of the team." 10 CFR 1046 requires a physical exam within 30 days prior to

a physical fitness qualification standards test or before entering a physical fitness training program.

The Team is recommending a mandatory physical fitness assessment for each courier that will result in an exercise prescription or an individualized physical fitness maintenance program. The Cooper Study Recommendation #8 stated, "At quarterly assessments, individual couriers should also receive assessments on flexibility and body composition … feedback is valuable to personal fitness and injury prevention." Implementation and adherence to the maintenance program is critical to success.

Treadmill Use

Treadmill use for one-mile qualification runs approved in 1996.

To meet the physical fitness one-mile qualification run, TSD has allowed the Special Agents to use a treadmill. The run on the treadmill was initiated at the request of the Special Agents, because of windy and other adverse weather conditions. Early versions of 10 CFR 1046 prohibited the use of treadmills for annual qualifications. There were discussions that the treadmill could provide assistance in the qualification and treadmill prohibition did not survive final rulemaking.

A March 11, 1996, TSD memo, *Use of the Trotter 585 Treadmill for Accomplishing Special Agent Run Qualification* approved the use of the treadmill as an alternative means for fulfilling the Special Agent one-mile run. The technical basis document dated February 7, 1996, supporting this decision is less than one page and indicated that the treadmill qualification had already been initiated because the qualification run was part of the treadmill purchase justification. According to Board interviews there was no medical evaluation for this approval.

The March 1991, DOE/DP/OSS *Medical and Fitness Implementation Guide* states, "During adverse weather conditions, a treadmill may be considered for the ½ and 1 mile qualifications. An actual course is preferred when attempting a qualification standard."

Physical Fitness Training

Physical fitness is sanctioned within TSD, but no monitoring of fitness activities to ensure aerobic, anaerobic, and strength training regimes have been conducted.

The physical fitness standards recommended by the studies referenced above stress the importance of a continuous fitness regime. In the Atterbom study, the recommended regime included long distance running, jogging, weight lifting, and high speed running. In the Cooper Study, the regime included aerobic training, anaerobic training and strength training.

Policy OPS-0108-95-004, *Job Sanctioned Physical Fitness for Nuclear Material Couriers* (dated June 20, 1995) allows for three hours a day for total body fitness activities while at the Section and one hour overtime while on Rest Over Night status. The total fitness activities described in this policy are similar to those recommended by the Cooper Study. However, there is no monitoring of the Special Agents fitness training to ensure there is a proper mix of the three types of training as prescribed by their physical fitness evaluation. The Convoy Commander or Chief/Unit Commander only certifies the physical fitness activities for overtime verification. There are no records of the fitness activity of Special Agents while on travel. A logbook at the SCS is used by the Special Agents to document their three-hour/day activities.

2.3.3 Emergency Management

Southeast Courier Section

A Memorandum of Understanding (MOU) between the Oak Ridge Operations Office (OR) and AL signed in March and April of 1996, respectively, identifies emergency response responsibilities for the SCS. This is the only documented agreement to provide emergency response capabilities for SCS facilities and/or qualification areas.

Per the MOU, the development of an Emergency Management Program (EMP) is the responsibility of OR through its operating contractor (currently Lockheed Martin Energy Systems Corporation). The Emergency Management section of the MOU is limited in scope to the SCS facilities, the firing range, and the Maintenance Facility. The operating contractor is responsible for providing emergency response to the SCS and the firing range.

MOU between OR and AL signed in 1996 and requires periodic assessments.

In addition, the MOU states that the "operating contractor's EMP for the facilities will be referenced in the overall TSD EMP. This requirement is included in Table 1 of the Interim TSD *Emergency Management Plan*, dated December 15, 1998. The MOU continues by stating that "Periodic assessments of the operating contractor's EMP for these facilities will be performed by TSD personnel."

Section D.1 of Southeast Courier Section Policy 001, *Quarterly Qualification Run Testing*, dated August 6, 1996, states that the appropriate Site Emergency Plan be enacted. The policy includes a Site Emergency Plan for qualification runs conducted at the Oak Ridge High School Track and the Melton Hill Dam. However, there is not a similar emergency plan for qualifications conducted on the treadmill.

Interviews conducted by the Board identified that emergencies that occur at the Oak Ridge High School track will be handled through the City of

Oak Ridge emergency response "911" process. SCS personnel have been told that Lenoir City will provide the emergency response to the Melton Hill Dam. However, SCS personnel were unsure whether Lenoir City would respond, or if they would request Roane County emergency to handle the call. (The dam is situated close to the border of the Roane County and Lenoir City response areas).

A discussion with the SCS Section Chief, indicated that the most recent emergency response exercise was performed exclusively by SCS personnel at the Melton Hill Dam. A simulated call was made to 911 and the patient was transported to the local hospital in the TSD support vehicle. The Site Emergency Plan states to call 911, drive to the junction at Highway 95 and wait for the emergency response vehicle.

Emergency response requirements are not well defined and exercises do not follow the plan.

In TSD's response to the Type A Pantex fatality to the AL Manager on April 18, 1996, the TSD Director committed that TSD will ensure that site specific plans will be written for each Courier Section. These plans are to document emergency response capabilities between on-site emergency medical services personnel and personnel administering fitness qualifications. In addition, there was a commitment to "…address the need for medical evacuation by helicopters in each section's site-specific plan." Aside from the MOU between OR and AL and the Site Emergency Plan noted above, the Board was not able to locate any specific, written plans documenting specific emergency response capabilities at SCS.

Oxygen is required to be present for qualification runs at Melton Hill Dam and the Oak Ridge High School track by SCS Policy 001 (Section C.1), entitled *Quarterly Qualification Run Testing and Emergency Response*, dated August 6, 1996. However, oxygen is not required to be available for treadmill qualifications and no one at SCS has medical authorization to administer oxygen. This is also the case at the two other courier sections. Board interviews identified that personnel have been trained to use oxygen and would have used it if available and needed. Furthermore, AEDs are not available or required, for any qualification or fitness activity.

TSD

The TSD Emergency Response Program is described in the interim TSD *Emergency Management Plan*, dated December 15, 1998. This plan focuses on responding to major Transportation Safeguards System accidents and the required emergency response. Table 1 of this plan states that the SCS falls under the Y-12 Emergency Management Plan. Table 1 also identifies that the Albuquerque Courier Section falls under the Sandia National Laboratory/New Mexico (SNL/NM) Emergency Plan and the Pantex Courier Section (PCS) fall under the Pantex

Emergency Management Plan. There are no specific core requirements to ensure consistency in the medical emergency response activities for the three courier sections. The MOU with SCS is discussed above.

There is no formal plan for Albuquerque Courier Section emergency response. SNL/NM has indicated their medical group will not respond unless there are contractual provisions and funding provided for these services. The SNL/NM medical facility is located within one block of the Albuquerque Courier facility.

The PCS does not have a formal plan and agreement with Mason Hanger Corporation and Battelle-Pantex to provide initial medical response and interface with the city emergency responders. As a result of the Pantex fatality in 1995, the need for helicopter response and permission to land at Pantex are important considerations. The current MOU between the Amarillo Area Office and TSD has one sentence under Medical Treatment. "The operating contractor medical facility will provide emergency first-aid and emergency transportation to medical facilities for all TSD employees stationed at PCS."

As noted above, the TSD Director committed to the AL Manager in 1996 to implement formal site specific plans for all TSD sections. No actions have been taken to date.

In addition, there has been no formal, rigorous TSD assessments performed to ensure consistent emergency response for all sections. For example, is there only EMT response at all sections or will some emergency responders be authorized to administer cardiac drugs? An analysis of needs for local emergency response has not been performed.

2.3.4 Program Reviews

TSD lists 31 assessments in their *Transportation Safeguards Division Assessment Survey Tracking* system. These assessments date back to 1995 and include internal and external assessments of various TSD functions.

The Board reviewed the reports for the 1995, 1997, and 1998 TSD self-assessments and the plan for the ongoing 1999 assessment. These assessments did not identify that the medical program, physical fitness program, or qualification standards had been reviewed for effectiveness.

Effectiveness of Physical Fitness and Medical programs not addressed in TSD self-assessments.

A review of training and Special Agent qualifications is a part of the TSD self-assessment process. However, this review focuses on compliance with existing requirements (e.g., are qualification runs completed on schedule) rather than the effectiveness or adequacy of the program as a whole.

No findings were identified in these self-assessments for the SCS implementation of the qualification program. The report for the 1997 self-assessment did identify a finding in the safety and health section that the exercise physiologists at all three courier sections were not receiving copies of injury/illness reports.

As identified in Section 2.3.3 above, the 1996 MOU between OR and AL states that TSD will conduct periodic reviews of the Emergency Management Program. The Board could find no evidence that any such reviews had been conducted to date.

The two most recent Contractor Performance Reports for the medical contract with TSD were reviewed. Lovelace Scientific Resources, Inc., was awarded the contract from March 7, 1994 – April 2, 1999, for a total of nearly $3 million. The Contract Performance Report dated October 1997 – March 1998, indicates an overall high performance rating. It states 75% of the Special Agents were satisfied with the services provided. In addition, it states the SOMD practiced an "open door" policy regarding medical questions or issues. The performance report rates the contractor with the highest rating in three of the five categories. The remaining two categories are only one point below the highest rating. The overall score for the rating during this performance period was exceptionally high.

The Contractor Performance Report period from April 1998 – April 1999 was also reviewed. This was the final performance rating for the five-year contract with Lovelace Scientific Resources, Inc. The performance rating clearly indicates DOE was unsatisfied with the services provided during this period. The report describes that users were unsatisfied with the services provided. It is noted that there were issues regarding improper billing, lengthy waits for physicals, and incompleteness of physical exam results. During this period, the contractor was rated merely fair or good in four of five categories, including the assessment of the SOMD; whereas, the prior performance rating had evaluated the contractor's services beyond excellent. The comments section states that the SOMD did not understand DOE requirements and repeatedly had to be reminded that the Special Agents do not fall under Department of Transportation requirements and are only covered under DOE regulations.

2.3.5 Integrated Safety Management

TSD is developing an implementation plan for ISMS.

The Integrated Safety Management System (ISMS) is a Secretary of Energy initiative described in DOE Policy 450.4 (dated October 15, 1996). This system focuses on analyzing the hazards of the work to be performed, implementing proper controls, conducting the work using established controls, and soliciting feedback that results in improvements

to the overall system. TSD is currently developing an implementation plan for ISMS that addresses the work, the requirements and ensures formalized feedback and improvement.

Previous DOE Accidents / Incidents Providing Feedback

The Board identified judgments of need from similar accident investigations.

The Board reviewed the following reports of fatalities related to physical fitness qualification, which have occurred in the DOE complex:

- Investigation of the Death of a Patrolman During Physical Testing, Hanford October 23, 1979;
- Fatality of a Wackenhut Services, Inc. Employee during a Physical Fitness Standard Test, Nevada Test Site (NTS), December 14, 1989; and
- Fatality of a Security Police Officer Involved in a Physical Fitness Qualification Test, Pantex, December 16, 1995.

The following Judgments of Need, addressing medical and physical testing issues, were identified in the above reports:

- There is a need to ensure that the examining physicians understand and comply with the medical requirements. (Hanford)
- There is a need to conduct the physical fitness test within 30 days of the physical exam. (Hanford)
- There is a need for physical fitness data to be provided to medical. (NTS)
- There is a need to access the individual's medical suitability prior to the physical fitness standard. (NTS)
- There is a need to develop a system to determine when an individual's requisite fitness level is not being maintained. (NTS)
- Activities of medical and the fitness specialists need to be fully integrated to ensure a timely knowledge of each Security Police Officer's (SPOs) medical condition and fitness level before medical certification is determined and before the annual qualification is attempted. (Pantex)
- SPOs need to maintain year round level of fitness that would allow them to meet physical fitness qualification standards at any time without undue risk of injury. (Pantex)

- SPOs of marginal fitness levels need to be identified and supervised in their efforts to improve before attempting an annual qualification test. (Pantex)

Of note, from the discussion in the Hanford Report, the Board stated that the "fitness test must be carried out within 30 days of the medical evaluation as physical conditions in 50-60 year olds may change in a three month period."

Hanford accident investigation reemphasized a 30-day time frame between medical evaluations and fitness tests.

In response to the Pantex fatality, DOE/AL requested on March 21, 1996, that TSD respond as to what actions should be taken to improve existing physical fitness programs for protective force personnel. TSD replied to the AL Manager on April 18, 1996, and indicated they were reviewing and reevaluating these processes. In 1999, TSD made contractual changes to integrate Physicians and Exercise Physiologists, and ensure timely exchange of information pertaining to medical conditions and fitness levels. However, the other actions committing to a formalized emergency response capability, addressing access of evacuation helicopters and the committee recommendation for the need for a mandatory fitness evaluation have not been completed.

TSD did not implement all of their actions in response to the 1996 Pantex fatality.

ORPS/CAIRS Review

The Board also conducted a search of the ORPS and the Computerized Accident/Incident Reporting System (CAIRS). The search identified four ORPS reports (not including the report for the Pantex fatality described above). Two additional accidents were identified in the search of the CAIRS database. These reports identified medical situations similar to the one involved in this accident.

Of particular note is a CAIRS report from 1991 involving a Special Agent in the TSD rehabilitation program at the Albuquerque Courier Section. The Special Agent experienced an irregular heartbeat, dizziness, trouble breathing, nausea, and pulse palpitations. An investigation conducted by TSD recommended that a comprehensive cardiac evaluation be performed prior to rehabilitation program participation. This recommendation is consistent with the requirements of 10 CFR 1046 for a medical evaluation not more than 30 days prior to entering a physical rehabilitation program.

1991 CAIRS report prepared by TSD recommended 30 days between medical examinations and starting a rehabilitation program.

The Board has not determined that this recommendation has been further assessed or implemented by TSD.

2.4 BARRIER ANALYSIS

The Board identified physical, management, and administrative barriers between Special Agent #1 and the effects of the physical fitness

qualification run. These barriers are summarized in Figure 2-1 and are discussed below.

Physical Barriers

Age

The aging workforce issue was identified by TSD in 1993 and evaluated by the Cooper Study. Although the Study agreed that the aging workforce was an issue, it concluded that Special Agents can meet the recommended physical fitness standards as long as they maintained an active physical fitness regime. TSD did not incorporate the mandatory physical fitness program recommended by the 1993 Cooper Study and this barrier is consequently ineffective.

Physical Fitness

In the past, Special Agent #1 had no difficulty passing his qualification run requirements and had maintained an active physical fitness profile. Based on Board interviews, Special Agent #1 ran or exercised while on travel. However, there is no record of the type and duration of the physical fitness activities performed while on travel, and there is similarly no monitoring of the physical fitness activities performed while on post at SCS. Because a proper mix of aerobic, anaerobic and strength training cannot be assured, this barrier is not effectively in place.

Medical Fitness

Special Agent #1 had elevated cholesterol and persistent hyperlipidemia. The medical records do not indicate if he consulted with a private Physician to control these medical conditions, as had been repeatedly recommended by the Designated Physician. Also, when Special Agent #1 was diagnosed as having elevated blood pressure in 1997, it was two months after his medical exam before the TSD medical program noted this condition and Special Agent #1 was removed from the road. The lack of follow-up by a Private Physician and a problem list of historical medical issues contributed to the failure of this barrier regarding the medical condition of Special Agent #1.

Management Barriers

Medical Program

The TSD Medical Program is focused on fulfilling the PAP requirements. As a result, issues outside the PAP requirements are not evaluated. The 30 day requirement in 10 CFR 1046 for a medical exam before a qualification run is not incorporated into the medical exam schedule.

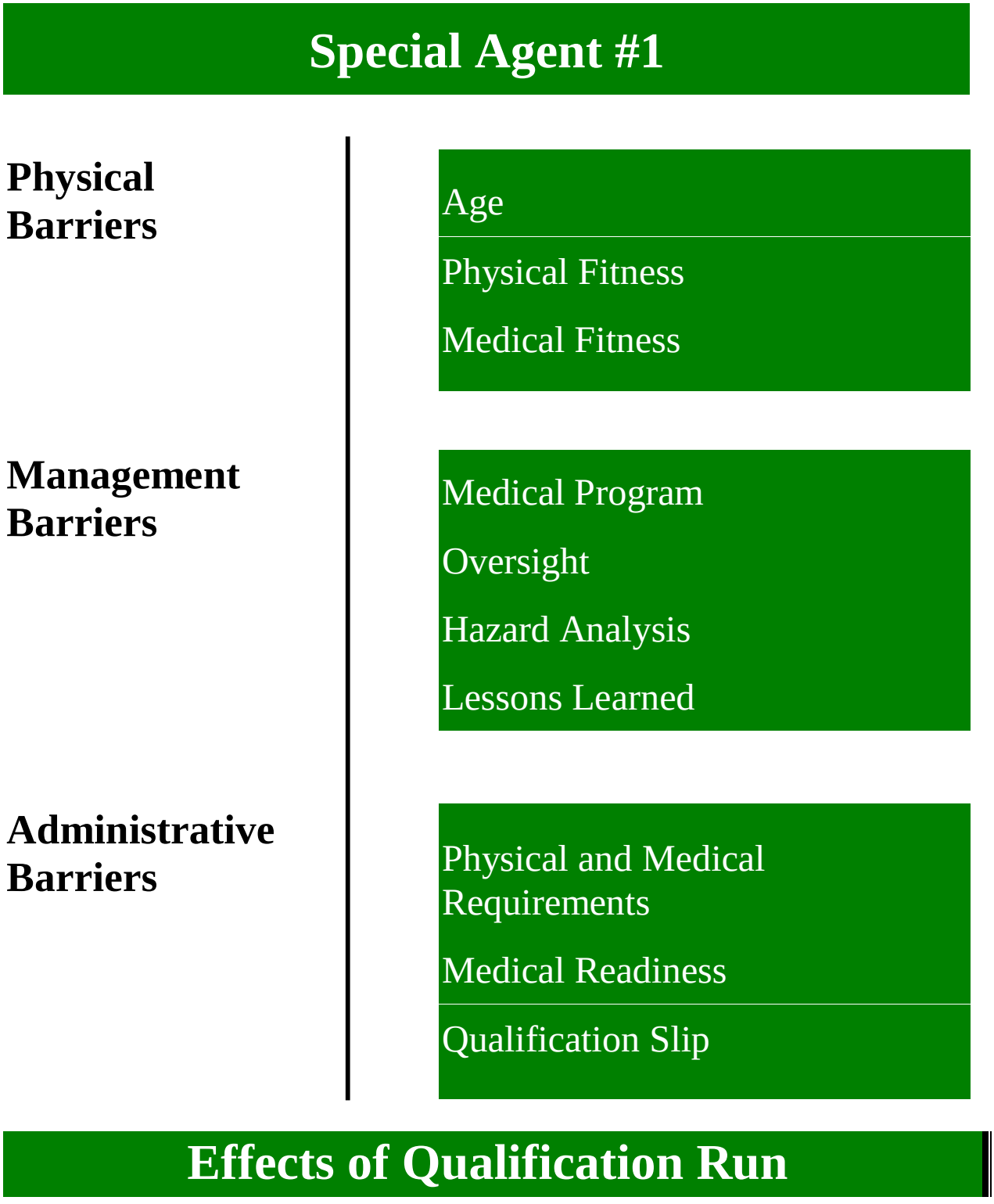


Figure 2-3: Barrier Analysis Summary

With the continual changes of Designated Physicians and SOMDs, there is no continuity in the Medical Program. This contributes to the barrier failure. Without the involvement of the Medical Program in all aspects of the TSD operations, this barrier failed.

Oversight

There was no external oversight provided to evaluate the Medical and Physical Fitness Programs at TSD. Although TSD personnel have conducted internal assessments of TSD, none of the assessments reviewed the adequacy or effectiveness of the Medical or Physical Fitness Programs. Because there was no oversight to ensure that these programs are in place, this barrier failed.

Hazard Analysis

The use of the treadmill as an alternative method for the one-mile qualification run was not reviewed by medical. Although the treadmill may provide an equivalent physiological challenge for running an eight-minute mile, the treadmill does not allow Special Agents to modulate their level of effort while performing the run. This compels the Special Agents to either complete the qualifying run or to just stop running.

The Exercise Physiologist's concern involving the stress test reaching only 85% of the Special Agent's capacity versus the near 100% demands of the qualification run was not addressed by TSD. In addition, the response to the Judgments of Need from the Pantex Plant Security Police Officer fatality were not fully addressed by TSD.

This barrier failed since TSD staff did not appropriately evaluate or validate these hazards.

Lessons Learned

Although TSD responded in 1996 to the AL Manager memo concerning the Judgments of Need from the Pantex Plant Security Police Officer fatality, the corrective actions that TSD identified in the memo were not completed. AL did not verify closure of TSD's actions beyond the receipt of the memo. Issues previously identified in Type A and B accident investigations were not captured as applicable lessons learned by TSD. As a result, this barrier failed.

Administrative Barriers

Physical and Medical Requirements

Initially the 1981 Atterbom Study established the physical and medical requirements for Special Agents. Since that time, additional studies have been conducted by Telfair and Cooper that suggested different as well as additional requirements. The Telfair Study recommendations were not implemented, since they applied only to DOE contractor employees, as documented in 10 CFR 1046.

In the case of the Cooper Study, age was addressed and other physical fitness recommendations were made. These recommendations were not implemented because of mission and cost issues. The physical and medical requirements barrier failed because new and potentially more effective physical and medical approaches were not effectively evaluated or implemented.

Medical Readiness

In 10 CFR 1046, a medical evaluation is required within 30 days prior to the qualifying run. There is no requirement applicable to TSD for medically evaluating Special Agents prior to their qualifying runs. As a result, this barrier failed.

Qualification Slip

A Qualification Slip is used at SCS to document that Special Agents do not have any medical restrictions, injuries or conditions that may affect their qualification attempt. The Exercise Physiologist at SCS additionally asks whether Special Agents are taking any medication. Special Agent #1 stated that he felt fine and made his run. There is no evidence that this barrier failed.

2.5 CHANGE ANALYSIS

A change analysis was conducted to determine any changes or differences that may have been causal factors in this accident. Analysis of changes and differences was performed to determine direct or indirect factors in the accident. These changes are presented in summary form in Table 2-1, and are discussed in detail in Section 2.3.

Table 2-1: Change Analysis Summary

Change or Difference		Analysis	
Planned/Normal Condition	**Present Condition**	**Difference or Change**	**Critique**
Medical Program identifies, tracks and mitigates early medical indicators.	Medical Program requirements are based on PAP requirements.	Medical issues not in the PAP requirements are not formally followed-up.	May miss early indicators of future problems.
Special Agent #1 is in good all around medical condition.	Special Agent #1 had high levels of blood lipids (cholesterol and triglycerides) identified in annual physicals back to 1986.	Elevated blood lipids not part of regulatory requirements; therefore not mitigated	
Reasonable continuity of physician staffing.	Physicians in the TSD Medical Program have changed frequently over the last 5 years.	Continuity of medical evaluations and familiarity with the Special Agents in the program is lost.	Physicians who routinely see their patients may more frequently identify and follow-up on early indicators of future problems.
Medical charts are current and include a summary of historical medical information and concerns. (Problem List)	Medical charts do not provide any summary of historical medical information or concerns. (Problem List)	Medical personnel do not have ready access to historical data.	Due to continual changes in program and Physicians, a summary of medical information is critical to follow-up on medical problems.
Medical professionals handle medical information in a confidential and private manner.	• Medical information to be followed-up by private Physicians is transferred to section secretaries for distribution to Special Agents and to be filed. • Medical information is not properly marked with Privacy Act requirements. • The most recent file on Special Agent #1 is 1996.	• Medical privacy is not maintained and no medical staff is readily available/ identified to discuss results with Special Agents. • Follow-up is informal or non-existent. • Medical files at the SCS are not current. • There is no way to track and verify	Formal follow-up of the referral to a Private Physician would encourage Special Agents to get medical intervention and would keep files current.

Change or Difference		Analysis	
Planned/Normal Condition	**Present Condition**	**Difference or Change**	**Critique**
		that Special Agents have received the information.	
A medically trained and qualified Case Manager formally tracks non-PAP medical issues and assures appropriate patient referral to and follow-up by private Physicians.	No Case Manager in place.	Non-PAP medical issues are not consistently provided to Special Agents, tracked, or forwarded in a manner which respects privacy rights.	A Case Manager would ensure prompt and appropriate feedback and tracking of medical issues.
Special Agents, Exercise Physiologists, and Physicians work synergistically to maintain top physical qualifications.	New medical services contract being implemented.	Special Agents and Exercise Physiologists are not familiar to Physicians.	Relationships and exchange of information between Physicians and Exercise Physiologists has been initiated with the April 1, 1999 contract.
Medical Qualification Standards are based on current consensus medical standards and protocols.	Medical Qualification Standards are dated and do not reflect up-to-date medical knowledge.	Medical thought and practices have not been evaluated for change since the standards were developed in 1981.	Medical Qualification Standards should be evaluated by an expert panel to ensure they are current.
The TSD Medical Program is rigorously and periodically assessed and evaluated to ensure currency and sustained quality.	The only evaluation conducted on the TSD Medical Program is the annual medical contract review.	• The TSD Medical Program has not been rigorously or periodically assessed and evaluated. • Provisions for periodic oversight are not established.	The TSD Medical Program has not been adequately reviewed.

Change or Difference		Analysis	
Planned/Normal Condition	**Present Condition**	**Difference or Change**	**Critique**
Roles and responsibilities for the TSD Medical Program are clearly defined and executed	The TSD Medical Program is an "orphan program" that is associated with PAP.	Ownership has not been established for the TSD Medical Program.	Roles and responsibilities for the TSD Medical Program are not established.
Medical stress test validates full capacity requirements for qualifying run.	Medical stress test attains 85% of the predicted maximum capacity. However, Special Agents must exert nearly 100% capacity to fulfill running qualifications.	• TSD cohort different than general cardiac patients. • No data to support 85% to 100% capacity. • Results at 100% capacity have more false positives.	Current medical stress tests may not fully assess the stress/risk profile of Special Agents performing the qualification runs or physical fitness requirements.
Special Agents participate in physical fitness evaluations and can easily perform all required physical tasks and qualifications.	The Physical Fitness Program recommended by the Cooper Study has not been implemented.	Some Special Agents have difficulty performing required physical qualifications.	Not all Special Agents maintain physical fitness 12 months out of the year.
Qualification run can be completed anytime within the month that the qualification run is required since Special Agents maintain continuous fitness standards.	Special Agent #1 was limited in the amount of time he had to complete his qualification run based on his travel schedule and his scheduled family leave.	Special Agent #1 had limited time to complete the qualification run due to travel and training requirements.	Special Agents are required to be physically fit year round. The current system limits the time Special Agents need to "demonstrate fitness" to four days a year.
Special Agent #1 is able to exercise regularly.	Special Agent #1 was in off-site training for the three weeks prior to his qualification run.	Special Agent #1 was not able to exercise regularly.	

Change or Difference		Analysis	
Planned/Normal Condition	**Present Condition**	**Difference or Change**	**Critique**
Qualification run no more than 30 days from medical evaluation.	• Special Agent #1's last physical exam was August 8, 1998. • Special Agent #1 performed qualifying runs in October 1998, January 1999, and April 1999.	• All runs were greater than 30 days from his last medical exam. • Annual physical exam is the only medical assessment performed.	Changes in medical condition can occur between medical evaluations and qualification runs.
Medically approved treadmill option is implemented for 1-mile qualification run.	The treadmill option was used prior to formal approval by TSD on March 11, 1996.	• No medical evaluation or involvement. • Limited technical basis report dated February 7, 1996.	Medical equivalency and involvement should have been part of original decision making process for treadmill use.
Treadmill used only during inclement weather as an alternative to qualifying on a road or track.	Treadmill is approved for unconditional use.	Treadmill used on regular basis.	
Emergency response should be rapid and appropriate to the risks and use highly trained personnel.	The emergency response personnel available at Courier Sections are not all trained as para-medics.	Early medical drug intervention and post-accident diagnostic EKG documentation is not available at all sites.	Evaluate the need for more highly trained emergency response personnel and the full use of available treatment techniques and technologies.
Oxygen, AEDs and emergency response kits are immediately available for all qualification runs and personnel are trained and medically authorized, as needed, in their proper use.	• Equipment requirements (i.e., oxygen and emergency response kits) for regular and treadmill qualification runs are not consistent and do not include the use of AEDs. • AEDs are not available onsite.	• Emergency procedures and equipment lists for qualification runs do not require comparable and appropriate equipment. • Life sustaining emergency equipment (AEDs) is not available.	Use of oxygen and the need for AEDs should be addressed by TSD.

Change or Difference		Analysis	
Planned/Normal Condition	**Present Condition**	**Difference or Change**	**Critique**
		• Oxygen could have been started immediately, but was not required for treadmill qualification.	
AED contains strip paper for recording heart rhythms.	Recording capabilities in the AED from Y-12 was disconnected.	No hardcopy of the measurements taken the day of the accident were available because of Y-12 security policy.	Recording capabilities of medical devices should be available to allow real time and future review.

2.6 CAUSAL FACTORS

Based on the *Certificate of Death* obtained by the Board, the Board identified the direct cause of the accident as an acute myocardial infarction suffered by Special Agent #1, with a secondary cause of a coronary occlusion of the left anterior descending coronary artery, and coronary artery disease.

Root causes are the causal factors that, if corrected, would prevent the accident. From a medical perspective, this accident could have occurred at any time. Therefore, a direct causal relationship to the qualification run that Special Agent #1 had just completed cannot be established, and there can be no assurance that a similar event will not occur in the future. However, the Board's mandate requires a review of TSD programs related to the accident, such as the medical and physical fitness programs. Weaknesses identified by the Board formed the basis for the causal factors, conclusions, and judgments of need identified below.

Based on the Board's analyses of the facts and the problems identified, the root cause of this accident was determined to be:

> Lack of effective integration and acceptance of suggestions and lessons learned within TSD.

The focus on mission requirements has lead to an organization not readily agreeable to change. It is essential that recommendations be fully and completely addressed in order to improve TSD programs. In addition, TSD has not integrated ISMS principles, such as "lessons learned" and the need for feedback, in its organizational culture, processes, and procedures.

The Moe Report evaluated whether TSD has an adequate mechanism in place for addressing and satisfying recommendations from reports, audits, appraisals, etc. The response to this evaluation was "Formally yes, but functionally TSD Management is not receptive to outside suggestions for change and improvement." The Board concurs with this assessment.

Contributing causes are events or conditions that collectively with other causes increased the likelihood of an accident, but that individually did not cause the accident. The Board identified the following contributing causes of this accident:

- TSD Medical Program does not track non-PAP findings and medical records do not highlight historical issues.
- Recommendations to improve the Physical Fitness Program have not been implemented.
- Hazard analysis of Special Agent qualification processes has not been rigorously accomplished.
- TSD has not developed a lessons learned program.
- Oversight of the completeness and effectiveness of TSD Medical and Physical Fitness Programs has not been conducted.

The Board also identified that formal emergency response mechanisms have not been completed by TSD. This was not identified as a contributing cause, given the appropriate and timely response to this accident. However, the Board identified specific areas of the emergency response program as needing improvement.

An Events and Causal Factors Chart used to analyze the causal factors is presented as Figure 2-4. A tabular summary of the analysis is included in Table 2-2.

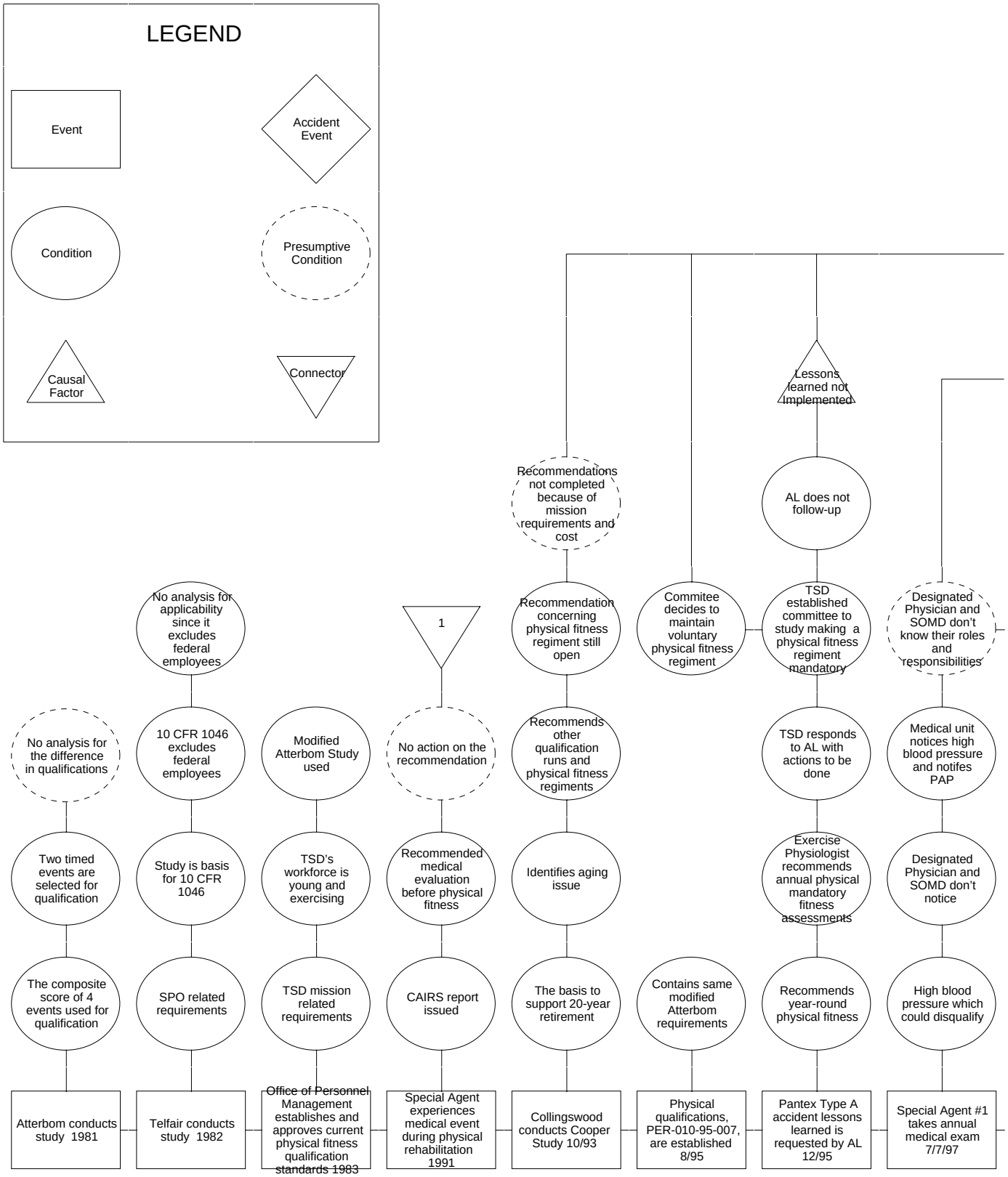
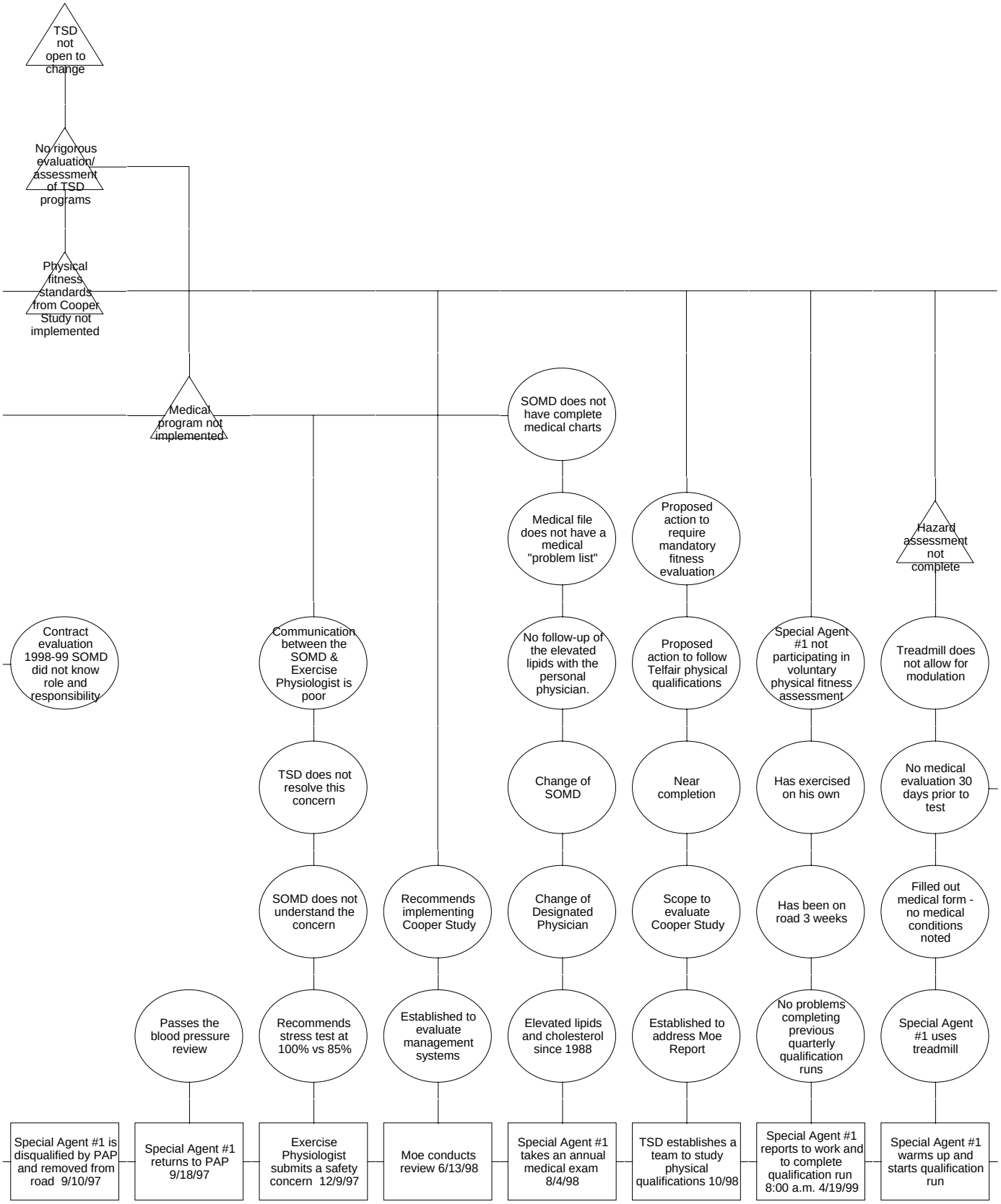
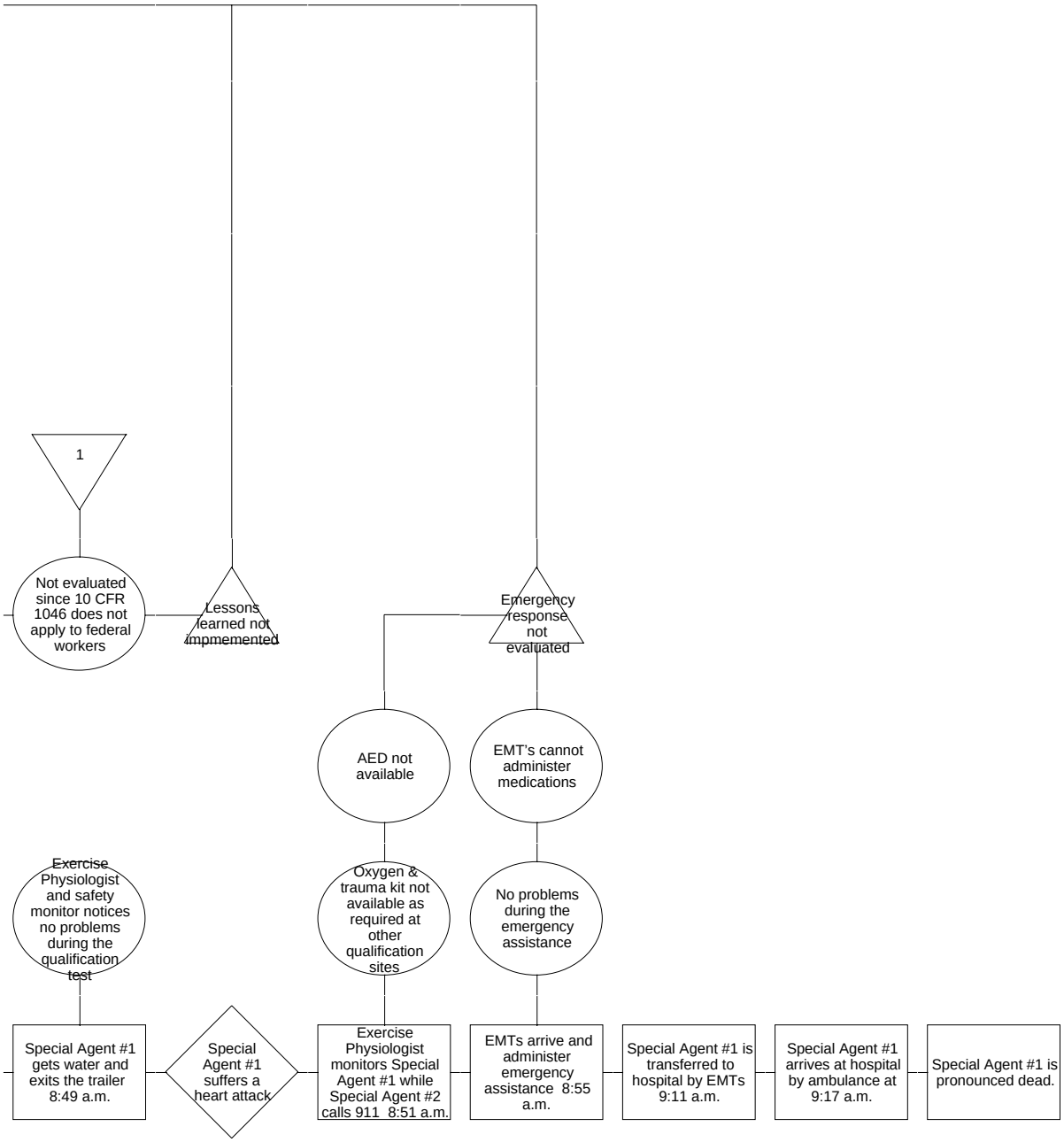


Figure 2-4: Events and Causal Factors Analysis Summary


TSD not open to change
No rigorous evaluation/ assessment of TSD programs
Physical fitness standards from Cooper Study not implemented
Medical program not implemented
SOMD does not have complete medical charts
Medical file does not have a medical "problem list"
No follow-up of the elevated lipids with the personal physician.
Change of SOMD
Change of Designated Physician
Elevated lipids and cholesterol since 1988
Special Agent #1 takes an annual medical exam 8/4/98
Proposed action to require mandatory fitness evaluation
Proposed action to follow Telfair physical qualifications
Near completion
Scope to evaluate Cooper Study
Established to address Moe Report
TSD establishes a team to study physical qualifications 10/98
Special Agent #1 not participating in voluntary physical fitness assessment
Has exercised on his own
Has been on road 3 weeks
No problems completing previous quarterly qualification runs
Special Agent #1 reports to work and to complete qualification run 8:00 a.m. 4/19/99
Hazard assessment not complete
Treadmill does not allow for modulation
No medical evaluation 30 days prior to test
Filled out medical form - no medical conditions noted
Special Agent #1 uses treadmill
Special Agent #1 warms up and starts qualification run
Contract evaluation 1998-99 SOMD did not know role and responsibility
Special Agent #1 is disqualified by PAP and removed from road 9/10/97
Communication between the SOMD & Exercise Physiologist is poor
TSD does not resolve this concern
SOMD does not understand the concern
Recommends stress test at 100% vs 85%
Exercise Physiologist submits a safety concern 12/9/97
Passes the blood pressure review
Special Agent #1 returns to PAP 9/18/97
Recommends implementing Cooper Study
Established to evaluate management systems
Moe conducts review 6/13/98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Not evaluated since 10 CFR 1046 does not apply to federal workers
Lessons learned not impmemented
Emergency response not evaluated
AED not available
EMT's cannot administer medications
Exercise Physiologist and safety monitor notices no problems during the qualification test
Oxygen & trauma kit not available as required at other qualification sites
No problems during the emergency assistance
Special Agent #1 gets water and exits the trailer 8:49 a.m.
Special Agent #1 suffers a heart attack
Exercise Physiologist monitors Special Agent #1 while Special Agent #2 calls 911 8:51 a.m.
EMTs arrive and administer emergency assistance 8:55 a.m.
Special Agent #1 is transferred to hospital by EMTs 9:11 a.m.
Special Agent #1 arrives at hospital by ambulance at 9:17 a.m.
Special Agent #1 is pronounced dead.

Table 2-2: Causal Factors Analysis Summary

Root Cause	Discussion
Lack of effective integration and acceptance of suggestions and lessons learned within TSD.	It is essential that recommendations and lessons learned be fully and completely addressed in order to improve TSD programs. TSD is a mission-oriented organization. However, the focus on mission requirements has lead to an organization not readily susceptible to change. The Moe Report evaluated whether TSD has an adequate mechanism in place for addressing and satisfying recommendations from reports, audits, appraisals, etc. The response to this evaluation was "Formally yes, but functionally TSD Management is not receptive to outside suggestions for change and improvement." The Board concurs with this assessment.
Contributing Causes	**Discussion**
TSD Medical Program does not track non-PAP findings and medical records do not highlight historical issues.	The cohort of Special Agents has become older and are, or can reasonably be expected to, experience medical problems not addressed in the basis for the current standards. Medical Program standards were established in 1981 based on a younger cohort. Medical knowledge and techniques have evolved since that time. Changes in Special Agent medical conditions, outside the scope of PAP requirements, can be as significant as those within the program. Continuing changes in the medical providers require a mechanism to provide physicians with historical medical information. This information is needed to make sound medical decisions on Special Agent's overall health.
Recommendations to improve the physical fitness program have not been implemented.	Studies have addressed the importance of an effective Physical Fitness Program to maintain a uniform level of physical fitness of Special Agents year round. The Cooper Study also identified that physical fitness is independent of age, if the individual is exercising regularly. TSD is in the initial stages of reassessing the 1993 Cooper recommendations.

Contributing Causes	Discussion
Hazard analysis of Special Agent qualification processes has not been rigorously accomplished.	In order to mitigate hazards a comprehensive hazard assessment must be completed in order to identify those hazards. This assessment must include the expertise in specialized fields in order to do a complete assessment of the hazards. TSD is attempting to bring the interface between its Medical and Physical Fitness Programs together through the development of its new contract for medical and physical fitness services. However, the analysis of hazards that may result from the implementation of Physical Fitness Program qualification requirements has not been assessed from a medical perspective. As an example, the Special Agents brought up the use of the treadmill as a suggestion because of adverse weather conditions experienced at the courier sections. The implementation of this suggestion was completed without the benefit of a medical analysis.
TSD has not developed a lessons learned program.	Identifying and addressing lessons learned are a fundamental part of any continuous improvement program. TSD did not complete the actions developed in response to the Judgments of Need from the Type A Accident Investigation at the Pantex Plant. TSD also did not address the recommendation made in a 1991 CAIRS report.
Oversight of the completeness and effectiveness of TSD Medical and Physical Fitness Programs has not been conducted.	Periodic assessments of programs are necessary to ensure that the TSD Medical and Physical Fitness Programs are effective and continue to meet TSD's needs. The Board could locate no evidence to indicate that organizations external to TSD have conducted an assessment of either the Medical or Physical Fitness programs even though these programs have remained in place for approximately the last 15-20 years. The scope of the internal self-assessments are limited to compliance reviews to ensure that program requirements are met. This does not address the more meaningful question as to whether those requirements provide an acceptable program.

Other Causes	Discussion
Formal emergency response site specific plans have not been completed by TSD.	It is necessary to have complete up to date, consistent, and effective Emergency Response Plans with local organizations to ensure that proper emergency response will be available when needed. TSD has not completed the corrective actions described in their 1996 commitment to the AL Manager. In addition, medical opinion identifies that the chance of recovery of an individual is greater the sooner the emergency equipment such as an AED and oxygen can be used. The Board identified that the use of AEDs had not been assessed and that the use of oxygen has not been medically authorized.

3. CONCLUSIONS AND JUDGMENTS OF NEED

This section of the report identifies the Conclusions and Judgments of Need developed by using the analytical methods described in Sections 2.4, 2.5 and 2.6.

The Board reached Conclusions based upon facts and pertinent analytical results. Based on the Conclusions, the Board rendered Judgments of Need to identify potential improvements to management, administrative and safety management systems. Follow-up actions should include managerial, administrative, and safety management controls and practices necessary to resolve the conditions identified in the Conclusions for each Judgment of Need.

Table 3-1: Conclusions and Judgments of Need

Conclusions	Judgments of Need
• The TSD Medical Program has experienced numerous changes over the past five years and is still unstable due to the recent contractual change in April 1999. • Designated Physicians and cardiologists performing annual Special Agent examinations have rotated. • The SOMD has changed four times since March 1998. • Several contract/subcontract changes have occurred in the past two years. • Ownership, roles, responsibilities, and relationships for Medical Programs are not well defined. • The medical contract evaluation for 1998 and 1999 indicated that the SOMD did not understand his roles and responsibilities. • The process for tracking and follow-up of individual medical issues that are not PAP requirements is informal and inconsistent, and does not include a Case Manager with a medical background. • The official occupational medical files and information are transferred between many physicians (Designated Physicians, cardiologists, SOMD) and completeness of the medical record is not assured. • A "problem list" of historical medical issues is not available to assist with continuity of follow-up.	• **TSD needs to implement a Medical Program that includes clear roles and responsibilities, processes for evaluating medical risks and stresses, and a tracking system to follow-up on medical issues.** • **DOE/EH needs to evaluate medical qualification standards for consistency with current medical practices and physical fitness standards.**

Conclusions	Judgments of Need
• The medical risks and stresses associated with TSD operations, particularly those relating to the Physical Fitness Program, are not effectively evaluated. • Medical qualification standards were developed in 1981 and have not been reevaluated to ensure that they are current.	
• TSD Physical Fitness Standards were established in the early 1980s and do not reflect the most current studies and medical information available. • The present voluntary physical fitness evaluation process does not effectively maintain the physical readiness of an aging Special Agent cohort. • The Cooper Study and other study recommendations have not been implemented. • The Medical Program and the Exercise Physiologists are at the preliminary stage of interacting to ensure the continual physical readiness of Special Agents. • An irregular and unmonitored exercise program, travel and training requirements, limited windows of opportunity to qualify and potential loss of PAP Certification and overtime pay, are factors inherent in the job of the Special Agents. • There is no TSD requirement to ensure that medical exams are performed within 30 days of qualification runs and of participation in Physical Fitness Rehabilitation Programs. • Due to TSD's mission, Special Agents need to maintain a year-round level of fitness that will enable them to meet their Physical Qualification Standards at any time.	**TSD needs to implement an integrated Physical Fitness Maintenance Program and current Physical Fitness Qualification Standards.**

Conclusions	Judgments of Need
• Emergency notification and response to this accident was timely and appropriate. • The recording capability of the AED used at SCS was not functional because of a Y-12 security policy. • Oxygen availability requirements are inconsistent. (not required to be available for treadmill qualifications required for qualification runs at the track and Melton Hill Dam) • No medical authorization is available to administer oxygen at any courier section. • TSD has effectively planned for high consequence accident scenarios. • The TSD Emergency Response Plan at the local Courier Sections is not consistently managed or executed. • The recent SCS emergency response exercise at Melton Hill Dam did not follow the established Emergency Response Plan and did not involve emergency responders external to TSD. • Emergency response equipment and personnel qualification requirements are not evaluated for consistency. • A needs analysis for local emergency response has not been performed.	**TSD needs to ensure that site-specific Emergency Response Plans are available and current, clearly identify specific equipment and personnel qualification needs, and are periodically exercised, as written.**
• Assessments of hazards associated with the TSD Medical and Physical Fitness Programs have been performed with limited scope efforts and internal resources. • The current TSD Physical Fitness Improvement Team is working under a limited charter and considers medical requirements outside of their scope. • Medical personnel were not involved in assessing the risks or benefits associated with using a treadmill for TSD physical fitness qualification runs. • Employee concerns regarding the Physical Fitness and Medical Programs have not been fully addressed. • The 1995 employee concern about the 85% versus 100% stress test results and qualification runs is not fully addressed. The current SOMD suggested that an	**TSD needs to implement a Hazard Analysis process.**

Conclusions	Judgments of Need
expert cardiology panel might be needed. • TSD has not addressed ISMS principles in the development and implementation of Physical Fitness Program requirements. • TSD has not effectively used outside experts and technical basis documentation. • Implementation of hazard analysis results has not occurred in a timely manner.	
• There is no formal process in TSD for evaluating, responding to or learning from the findings of relevant accident investigations, external program reviews or internal program assessments, or employee concerns. • Three out of the seven commitments made by TSD in 1996 in response to the Type A Investigation of the Fatality of a Pantex Plant Security Police Officer have not been met. • It cannot be determined whether the recommendations made in a 1991 CAIRS report involving a Special Agent in the TSD rehabilitation program were assessed or implemented by TSD. • TSD has not implemented feedback and continuous improvement Integrated Safety Management principles that facilitate the effective evaluation, response and implementation of corrective action or improvements to TSD programs and operations.	**TSD needs to develop and implement a formal Lessons Learned Program.**
• There is no record of external evaluation or oversight of TSD's Medical Program and Physical Fitness Program. • TSD has not performed the periodic assessments required by the emergency response portion of the MOU between AL and OR. • There is no formal and rigorous process for self-assessment that evaluates effectiveness and adequacy of the medical program. • TSD has not utilized outside expertise to implement and assess the effectiveness of the Medical and Physical Fitness Programs.	• **TSD needs to establish a self-assessment process that evaluates the performance and effectiveness of the Medical, Physical Fitness and Emergency Response Programs.** • **DOE/Headquarters and AL need to periodically assess the Medical, Physical Fitness and Emergency Response Programs.**

4. BOARD SIGNATURES

Gene E. Runkle
Accident Investigation Board Chairperson
U.S. Department of Energy
Albuquerque Operations Office

Date June 1, 1999

Nathan Morley
Board Member
DOE Accident Investigator
U.S. Department of Energy
Albuquerque Operations Office

Date June 1, 1999

David M. Caughey
Board Member
U.S. Department of Energy
Kansas City Area Office

Date June 1, 1999

5. BOARD MEMBERS, ADVISORS AND STAFF

Chairperson	Gene Runkle, DOE Albuquerque Operations Office
Member	Nathan Morley, DOE Albuquerque Operations Office
Member	David Caughey, DOE Kansas City Area Office
Medical Advisor	Dr. Ronald Goans, Radiation Emergency Assistance Center/Training Site/Oak Ridge Institute for Science and Education (REAC/TS/ORISE)
Accident Investigation Advisor	Ralph Fevig, DOE Albuquerque Operations Office
Administrative Support	Raquel Rodrigues, DOE Albuquerque Operations Office

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APPENDIX A
ORPS REPORT OF ACCIDENT

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Occurrence Report

Transportation Safeguards System

(Name of Facility)
Balance-of-Plant

(Facility Function)
Transportation Safeguards System Albuquerque Operations

Laboratory, Site, or Organization)
Name: TRUJILLO, ROSEANN M
Title: Management Analyst **Telephone No.:** (505) 845-5114

(Facility Manager/Designee)
Name: TRUJILLO, ROSEANN M
Title: MANAGEMENT ANALYST **Telephone No.:** (505) 845-5114

(Originator/Transmitter)
Name: Roseann M. Trujillo **Date:** 04/19/1999

(Authorized Classifier (AC))

1. **Occurrence Report Number:** ALO--GOAL-TSS-1999-0001
   USDOE Special Agent Fatality
2. **Report Type and Date:** Notification

	Date	Time
Notification:	05/05/1999	14:46 (MTZ)
Initial Update:		
Latest Update:		
Final:		

3. **Occurrence Category:** Unusual
4. **Number of Occurrences:** 1 **Original OR:**

5. **Division or Project:** Transportation Safeguards Division
6. **Secretarial Office:** DP - Defense Programs
7. **System, Bldg., or Equipment:** Southeastern Courier Section-Bldg.9983-88
8. **UCNI?:** No
9. **Plant Area:** Near Y-12
10. **Date and Time Discovered:** 04/19/1999 08:00 (MTZ)
11. **Date and Time Categorized:** 04/19/1999 08:30 (MTZ)
12. **DOE Notification:**

Date	Time	Person Notified	Organization
04/19/1999	09:13 (MTZ)	DOE/EOC	DOE/HQ

13. Other Notifications:

Date	Time	Person Notified	Organization
04/19/1999	08:00 (MTZ)	Kathy Carlson	AL/ONDP
04/19/1999	08:01 (MTZ)	Rick Glass	DOE/AL

14. Subject or Title of Occurrence:
USDOE Special Agent Fatality

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15. Nature of Occurrence:

03) Personnel Safety

A. Occupational Illness/Injuries

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16. Description of Occurrence:
On April 19, 1999, at 0900 hours EST, a 46 year old Department of Energy Special Agent (SA) collapsed following an exercise regimen in Building 9938-88, at the Southeastern Courier Section, Oak Ridge, TN. A resident Exercise Physiologist was present throughout the training. The SA had just completed a treadmill qualification run and stepped outside the building with the Exercise Physiologist when the SA complained that he did not feel well. Almost immediately, the SA collapsed. The Exercise Physiologist immediately called 911. At that time, the SA was unconscious, but breathing on his own. At the arrival of the ambulance and the EMT's, the employee was not breathing and Cardiopulmonary Resuscitation (CPR) was begun. The ambulance arrived at the facility at 0904 EST hours and the SA was administered CPR. The ambulance transported the employee directly to the Oak Ridge Methodist Medical Center where he was pronounced dead at 0945 EST hours.

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17. Operating Conditions of Facility at Time of Occurrence:
Normal

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18. Activity Category:
03 - Normal Operations

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19. Immediate Actions Taken and Results:
Notification to the employee's family and the Department of Energy, Albuquerque Operations Office, were made. An Accident Investigation team from the Albuquerque Operations Office has been appointed to conduct a Type A investigation.

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20. Direct Cause:
21. Contributing Cause(s):
22. Root Cause:

---

23. Description of Cause:

---

24. Evaluation (by Facility Manager/Designee):

---

25. Is Further Evaluation Required?: Yes
If YES - Before Further Operation? No
By whom? Accident Investigation Tea
By when? (Not given)

26. Corrective Actions
(* = Date added/revised since final report was approved.)

27. Impact on Environment, Safety and Health:

28. Programmatic Impact:

29. Impact on Codes and Standards:

30. Lessons Learned:

31. Similar Occurrence Report Numbers:

32. User-defined Field #1:
33. User-defined Field #2:

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APPENDIX B
TYPE A INVESTIGATION BOARD APPOINTMENT MEMORANDA

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EH2-012827

Department of Energy
Washington, DC 20585

April 20, 1999

MEMORANDMUM FOR RICHARD GLASS, MANAGER
ALBUQUERQUE OPERATIONS OFFICE

FROM: DAVID MICHAELS, PHD, MPH
ASSISTANT SECRETARY
ENVIRONMENT, SAFETY AND HEALTH

SUBJECT: Fatality Following Exercise by Special Agent

In accordance with DOE O 225.1A, Accident Investigations, I have determined that the investigation of the subject incident should be conducted under the direction of your office.

This investigation should be thorough and in accordance with the requirements of DOE O 225.1 to determine the root cause(s) of not only the physical aspects of the incident but also any failures of management systems that may have contributed to the fatality. I have directed the Deputy Assistant Secretary for Oversight to closely follow the conduct of the investigation. I expect you to keep him fully informed of your progress consistent with the standards for conducting these investigations.

cc:
V. Reis, DP-1
J. Wilcynski, FM-1
G. Podonsky, EH-2

DOE F 1325.8

United States Government **Department of Energy**

Albuquerque Operations Office

memorandum

DATE: APR 2 2 1999

REPLY TO: ISRD

SUBJECT: Establishment of an Investigation Board

TO: Kathleen Carlson, Assistant Manager, ONDP, AL
Steve Hafner, Director, Transportation Safeguards Division (TSD), AL

I hereby establish a Type A Investigation Board to investigate the fatality of a TSD Courier at the Oak Ridge Section that occurred on April 19, 1999.

The following individuals are appointed to the Team in the listed capacity:

Team Chairperson:	Gene Runkle, ISRD, AL
Accident Investigator:	Nathan Morley, ESHD, AL
Team Member:	David Caughey, KCAO
Medical Advisor:	Dr. Ronald Goans, ORISE
Administrator:	Raquel Rodrigues, ISRD, AL

The Board will be assisted by advisors, consultants and other personnel as determined by the Chairperson.

The scope of the Board's investigation will include, but not limited to, identifying relevant facts; analyzing the facts to determine the direct, contributing, and root causes of the incident; developing conclusions; and determining the judgments of need that, when implemented, reduce the probability of similar recurrence. The investigation will be conducted in accordance with DOE Order 225.1A.

The Board will provide my office with periodic reports on the status of the investigation, but will not include any conclusions until an analysis of all the causal factors have been completed. Four copies of the draft report should be provided to me by May 21, 1999, for review prior to its preparation in final form. Any delay to this date should be justified and forwarded to this office. Discussions of the investigations and copies of the draft report will be controlled until I authorize release of the final report.

By copy of this memorandum, I am advising the supervisors of each of the Board Members that his/her assignment is full-time until the investigation and report are completed. The advisors to the Board shall assist the Board in investigation on a

priority basis and provide input to this chairman, as requested. Board Members and advisors are requested to attend an opening briefing with the Oak Ridge Courier Section to be held in the DOE Courier Conference Room, Building 9107 at 8:00 a.m., on April 21, 1999.

for Rush D. Glass
R. E. Glass
Manager

cc:
V. Reis, DP-1, HQ
E. Ives, DP-20, HQ
D. Rhodes, DP-24, HQ
G. Podonsky, EH-2, HQ
C. Lagdon, EH-22
T. Uko, KCAO
L. Kirkman, OSS, AL
G. Runkle, ISRD, AL
C. Soden, ESHD, AL

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APPENDIX C
LIPID HISTORY – SPECIAL AGENT #1

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LIPID HISTORY – SPECIAL AGENT #1

Date	Cholesterol	Triglycerides	Coronary Risk Assessment Cholesterol/HDL Ratio
08/04/98	281	353	7.2
07/08/97	268	210	7.24
07/15/96	287	278	9.0
07/14/95	291	254	8.3
07/13/94	272	211	8.5
08/10/93	286	328	9.9
07/07/92	283	209	8.1
08/18/91	296	222	8.7
08/10/90	288	168	7.0
08/23/89	265	222	7.8
09/09/88	310	202	9.1
06/12/87	309	245	10.0
03/11/86	287	220	
Average	286 ± 14	240 ± 52	8.4 ± 1.0

Normal Range: cholesterol (125-200); triglycerides (10-150)
Coronary risk assessment for males: lowest (<3.5); low (3.5-4.4); average (4.5-5.5); high (5.6-10.9); highest >10.9.

Medical Record Referencing Lipid History

08/04/98 – MD #6 Cardiologist #1
07/07/97 – MD #5 – dietary restrictions recommended Cardiologist #1
07/15/96 – MD #4 Cardiologist #3
07/14/95 – MD #3 – should follow-up with private physician Cardiologist #2
07/11/94 – MD #2 Cardiologist #1
08/10/93 – MD #1 – "has not done anything about it (elevated lipids) to alter diet; will see his Physician if this bad again this year."
07/07/92 – MD #1
08/18/91 – MD #1
08/10/90 – MD #1
08/23/89 – MD #1
09/09/88 – MD #1
07/10/87 – MD #1
04/18/86 – MD #1

Medical Assessment: Special Agent #1 was seen by six different physicians in the time span 1986-1998; coronary risk profile, within statistical variation and life habit variation, is essentially constant in the high risk range over this time interval. Special Agent #1 was seen by three different cardiologists from 1994 to 1998, after reaching the age of 40.